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JANUARY 10th, 1946

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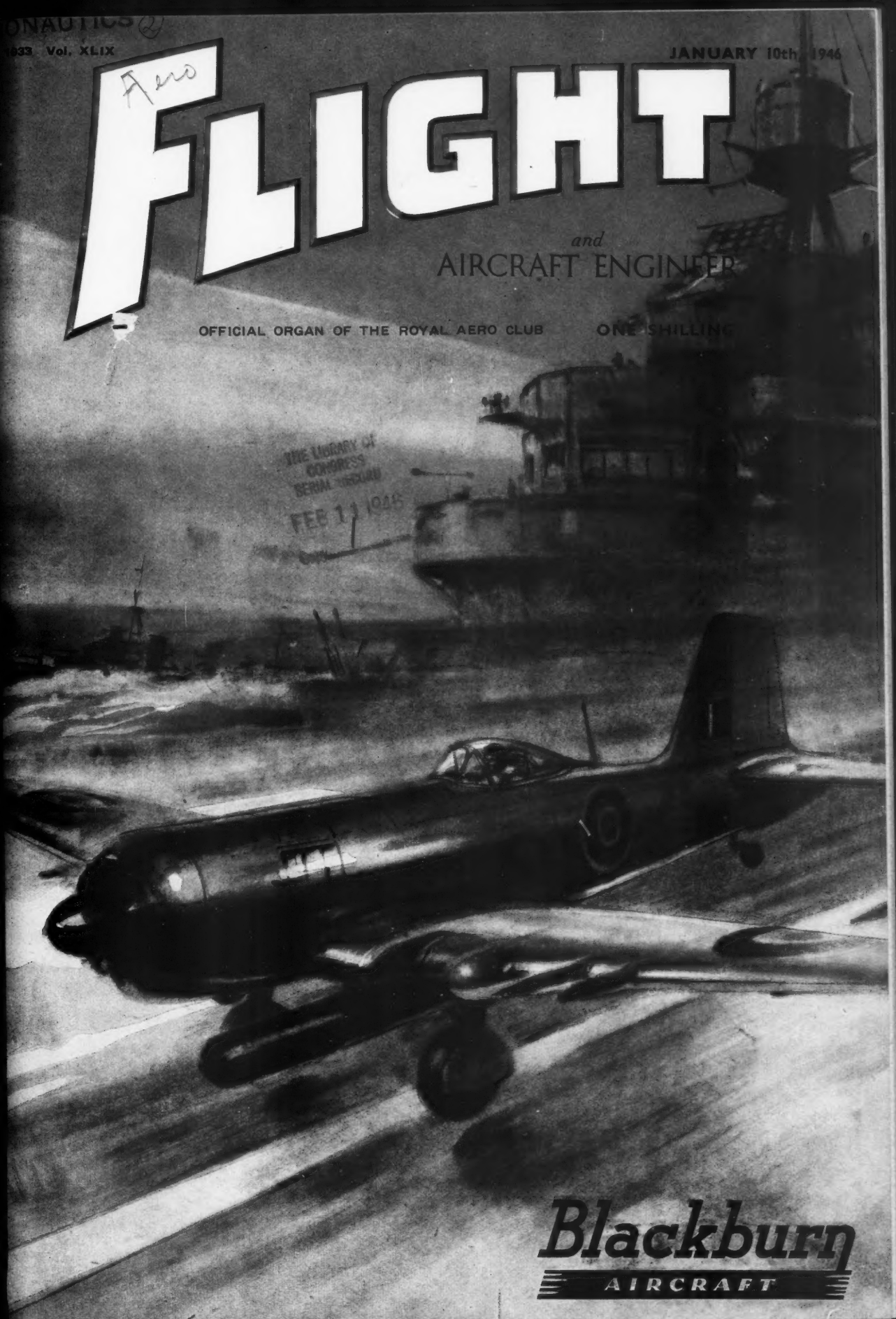

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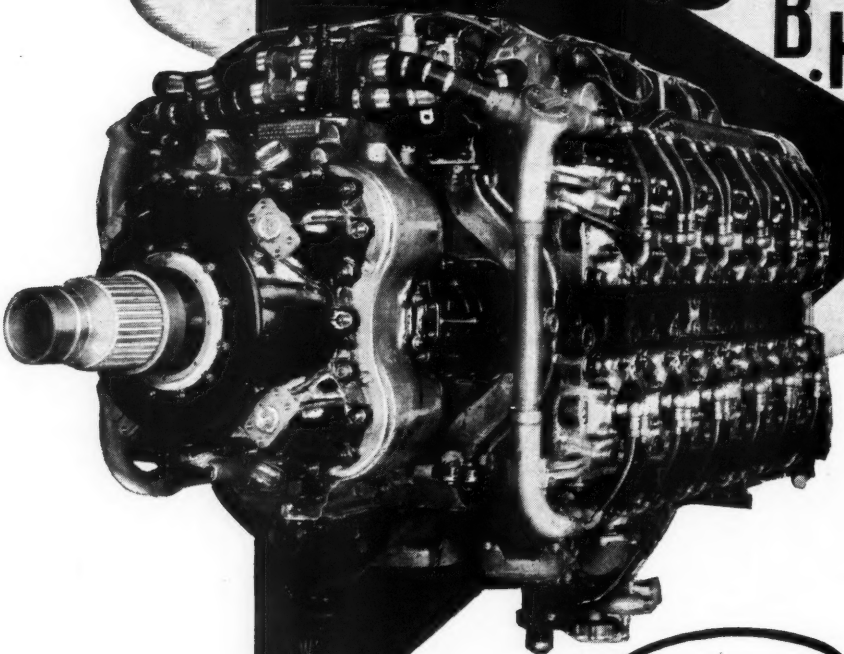

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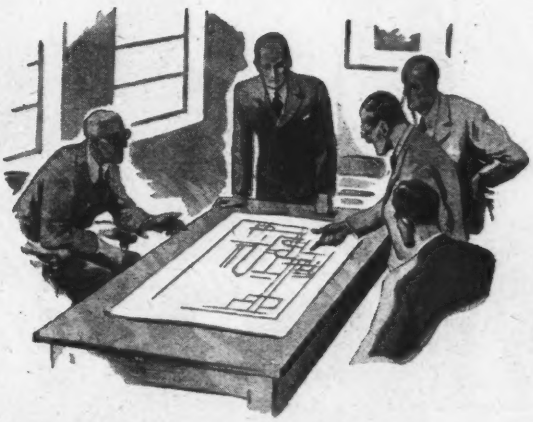

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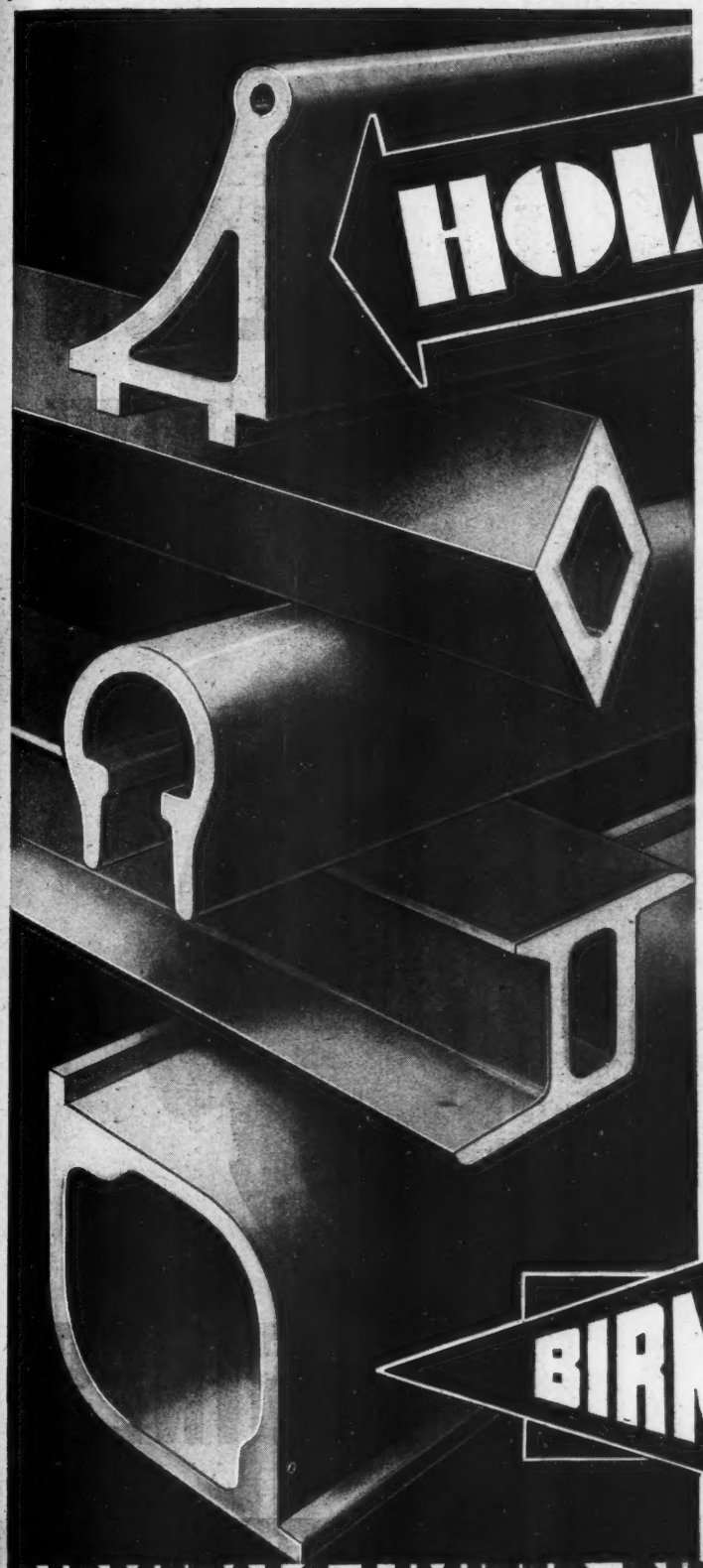

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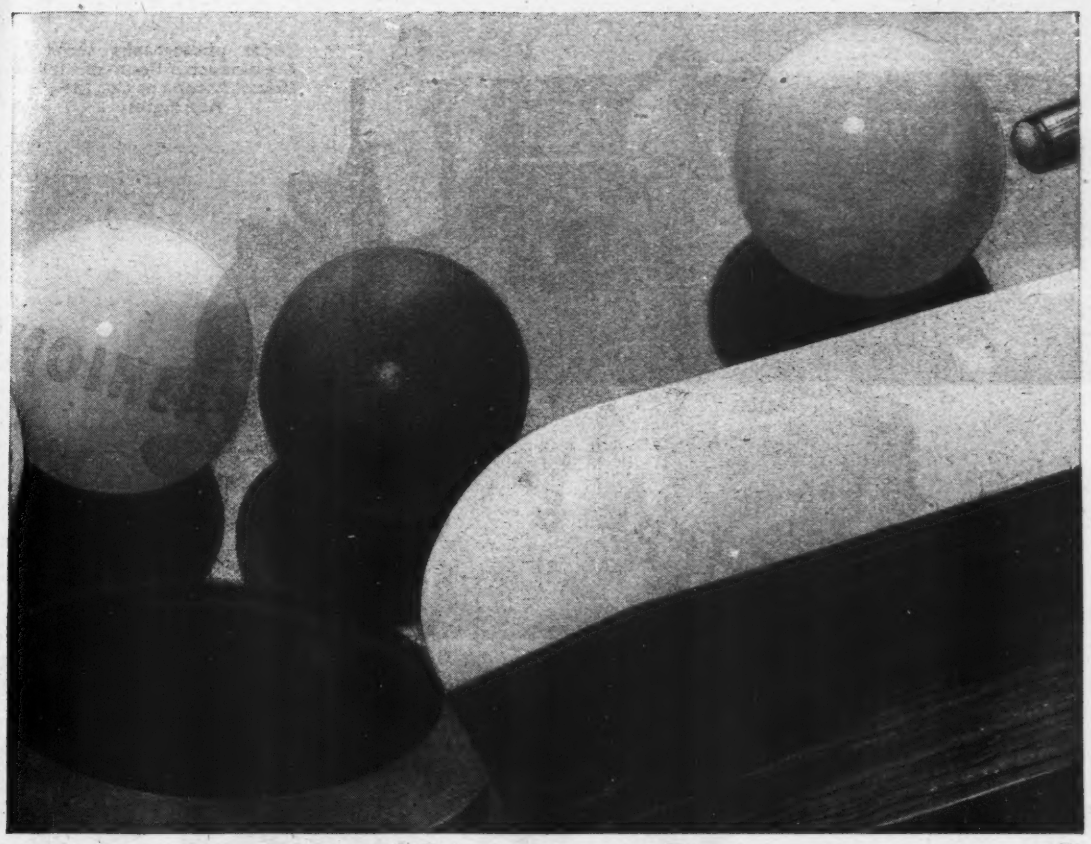

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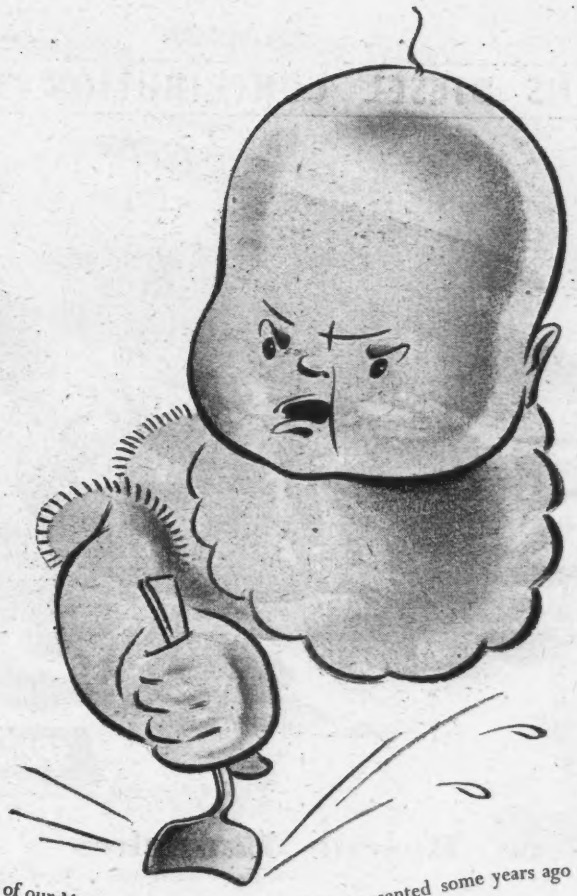

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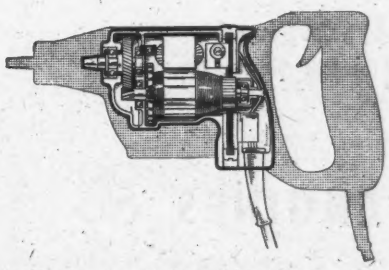

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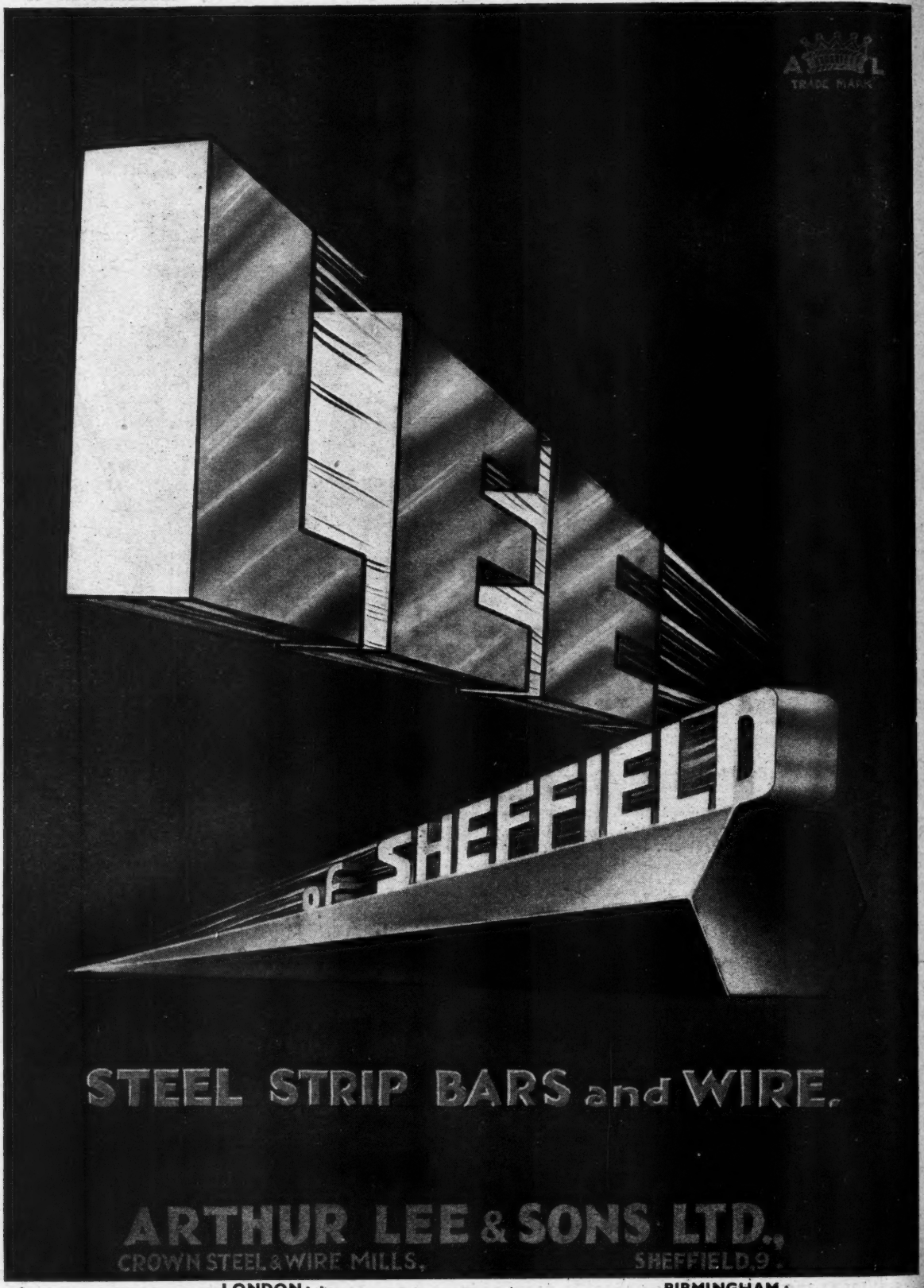

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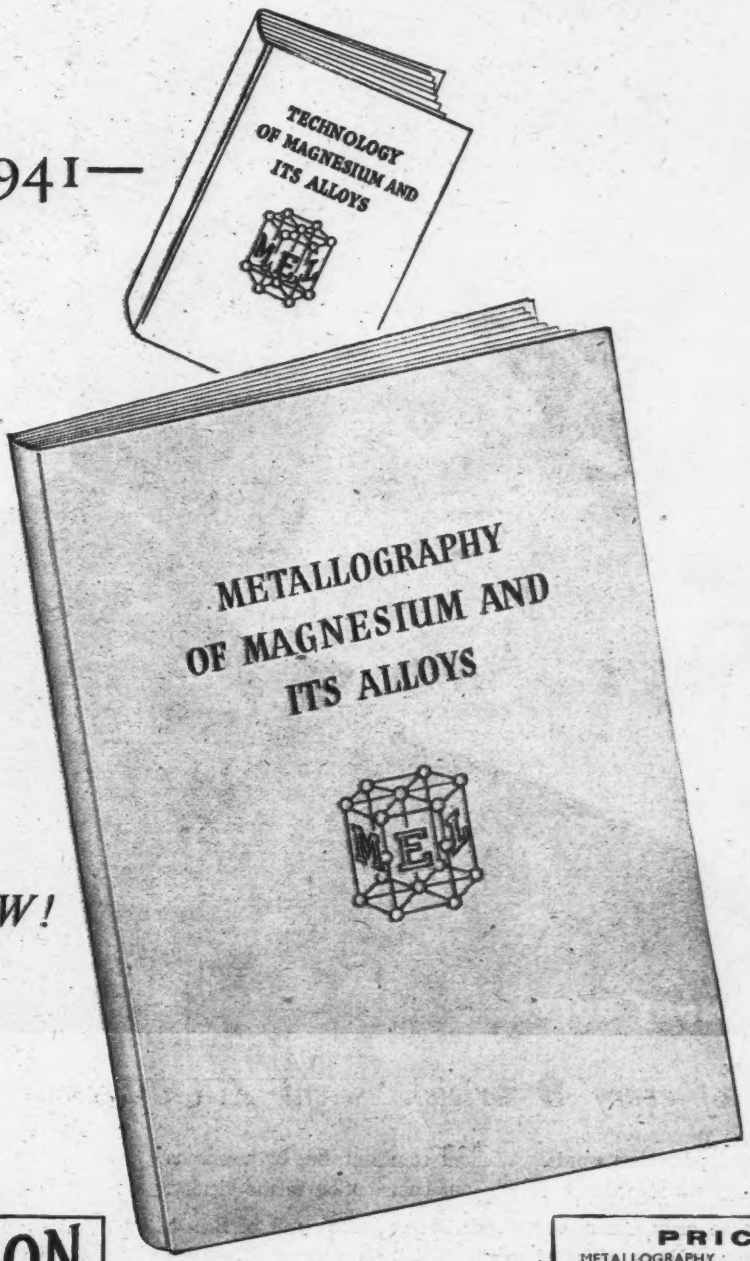

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The Outlook

New Year Gift

PREMATURE though the "opening" of Heathrow on New Year's Day probably was, the gesture was undoubtedly a good one from the propaganda point of view. But only so long as no one is permitted to think for a moment that a single runway, surrounded by a desolation of half-completed work, constitutes a usable airfield.

For at present Heathrow is hardly more than a bleak stretch of flat ground on which there is a single completed runway and an accompanying return taxi-track. Two more runways are under construction, and, at present, the only buildings available are of temporary wartime construction.

The airfield, in fact, is not likely to be capable even of partial use as a major airport before midsummer, and we can hope that the early baptism is not an indication that Heathrow will be prematurely opened for traffic while still very incomplete, and while plans are subject to any drastic modifications. Though alterations are inevitable and the work at such an airfield cannot possibly be finished quickly, nothing is worse, from the point of view of operating efficiency or prestige, than a terminal with inadequate facilities and on which work on a vast scale is still proceeding.

During the war the R.A.F. was often forced to use airfields as soon as the runways had been cleared, and sometimes even before they had been fully completed. That should never be necessary in peacetime civil operation. Even if London's new airport must inevitably be put to use while some airfield work has still to be completed, let us hope that the Ministry of Civil Aviation will see that it is at least practical and that the buildings are comfortable enough for serious civil operations and for the amount of traffic which will undoubtedly be handled.

The final layouts of the airfield itself and of the permanent buildings have, with the more complicated problem of access from London, yet to be considered. And the last is at least as important as the first, for nothing is more irritating to air passengers than a seemingly interminable journey by road before or after any journey by air. Unless this access problem is energetically solved, the initial reputation and value of Heathrow will be seriously affected. The ultimate cost of the new airport will be very considerable, so the success of the entire plan must not be jeopardised by lack of prompt attention to this most vital question.

During the "opening" ceremony Lord Winster showed pardonable pride in the project, and all who wish to see civil aviation prosper will echo that pride. And we will also hope that the rapid and energetic action so far displayed will be something more than the result of a temporary New Year resolution.

Speed and Range

WHEN Group Captain Wilson established a world's speed record on the Gloster Meteor of 606 m.p.h. he proved a fact which was already known from theoretical considerations: that jet propulsion can produce greater aircraft speeds than any other existing prime mover. To be of general utility, however, speed must be coupled with good fuel economy, and that the plain jet engine cannot yet give. The consumption is still far greater than that of the reciprocating engine in all but the fastest types of aircraft.

Several methods have been suggested, and quite a few actually tried, for improving the fuel consumption. As long ago as 1942 it was suggested in this journal that reciprocating engines driving airscrews might be used in conjunction with jet units on the same aircraft. Two such arrangements are described in this issue, the Ryan Fireball and the Blohm and Voss P-194, the former in actual service and the latter an interesting project which might have been realised if Germany had not been vanquished.

Without being quite so unorthodox, the mixing of

piston and jet engines in one aircraft might well take the form of a four-engined machine with two inboard piston engines and two outboard jet units.

Another way, which is being developed by more than one British firm, is to use a proportion of the power developed by the gas turbine to drive an airscrew. Examples are the Bristol Theseus and the Rolls-Royce Trent. It is likely that this combination will find extensive application during the next few years. It has the advantage that it combines simplicity and low weight with high thrust for take-off.

Where really long ranges are involved the system outlined by Dr. Harry Ricardo in the discussion of Air Commodore Banks's lecture to the Royal Aeronautical Society may be the solution. Briefly, his argument was that by using a two-stroke compression-ignition piston engine to deal with the small-volume, high-temperature part of the heat cycle, and the gas turbine for the large-volume, low-temperature part, fuel economies far better than any hitherto achieved should be possible. This may be a somewhat heavy and complicated method, but since the modern tendency appears to be towards long stages on air routes, even when no geographical obstacles to shorter stages exist, the Ricardo scheme should certainly not be overlooked.

This brief outline does not necessarily exhaust all the possibilities, but it serves to indicate that there is ample scope for ingenuity, and development during the coming years should be extremely interesting to watch.

Transport Command's Accident Rate

PUBLIC confidence in air travel as a whole should be restored to some degree by the statistics which have now been released to demonstrate that Transport Command during 1945 was a good deal less accident-prone than was British Civil Aviation during the five years preceding the war.

Whether such a comparison is fair or not we leave the reader to judge, but the figures do show that, so far as normal scheduled services are concerned, Transport Command has achieved the excellent record of only one passenger fatality for every forty million passenger-miles flown throughout 1945. No one who understands anything of the problems which the Command had to face in running these services during several months of the year when priorities of manning and equipment were the perquisite of the operational theatres will belittle this achievement.

Unfortunately, little is gained by setting off a good record against a less good one, and the fact still remains that the "trooping" figure of only one passenger killed for every three million passenger-miles flown does not become one whit less painful to anyone.

The circumstances are not improved by the unfortunate fact that proceedings of Service courts of enquiry are not published. It would improve not only the confidence of the public, but also the morale of the troops who are still waiting to be flown home, if they were told as quickly as possible to what the accidents to trooping aircraft are attributed and what urgent steps have been taken to prevent further accidents of a similar kind. Accidents to passenger aircraft, whether Service or otherwise, should be subject to public enquiry in the same way as accidents to passenger trains; otherwise no one can be blamed for imagining that there is a skeleton in the official cupboard.

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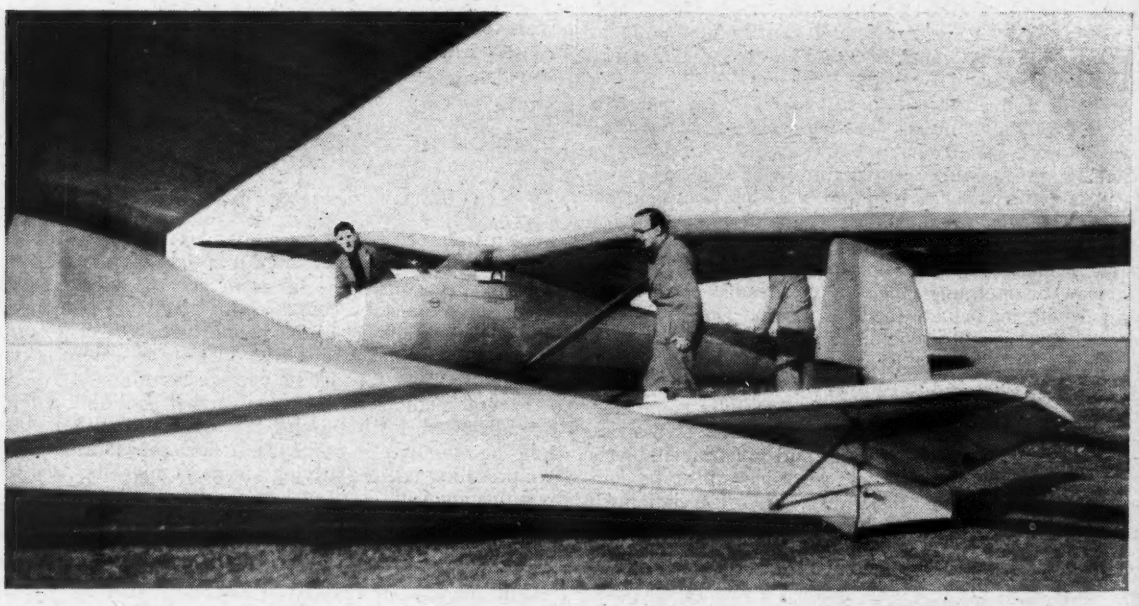


REALLY PEACEFUL FLYING: The scene at Bradwell Edge, Great Hucklow, where the Derbyshire and Lancashire Gliding Club has restarted flying. The glider being handled is a Kirby Kite, with a Kirby Kadet in the foreground.

Unlike Twins

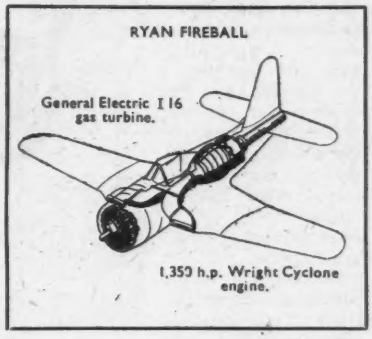
Novel American and Unconventional German Designs : The Ryan FR-1 Fireball and the Blohm and Voss P-194 01 : Jet and Piston Engines

ALTHOUGH a combination of piston and jet engines has been used to drive a single aircraft on several occasions in the past, the arrangement of Cyclone and I-16 engines in the Ryan Fireball is unique. A more unconventional combination characterises the German design, the Blohm and Voss P-194 01.

Earliest suggestions for the combined use of two dissimilar power units came from Campini, of the Italian Caproni Company, although in this case the small radial piston engine, driving an air compressor, was an essential component of the combination jet power unit. A later project using this principle, the Caproni-Campini C.C.2, flew in 1940.

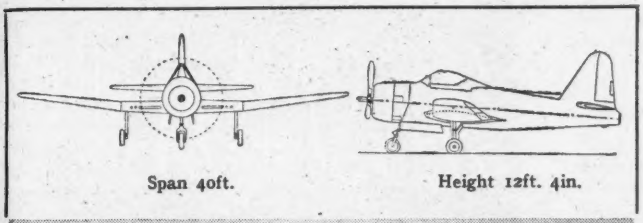
More recently a modified "three-engined" Wellington will be remembered. In this example a normal Wellington with two conventional Bristol radials was relieved of its rear turret, in place of which a W.2B jet engine was installed for flight tests. All three engines were, of course, self-contained units.

Of similar conception, the "five-engined" Lancaster universal test bed (illustrated in *Flight* of December 20th, 1945) is virtually a Lancaster with four Rolls-Royce Merlin engines but with an Armstrong Siddeley ASX jet engine in the modified bomb bay.



Another possible combination of jet and airscrew propulsion is exemplified by the Rolls-Royce Trent and Bristol Theseus engines, in which the major part of the available power is absorbed by a large-capacity gas turbine which then drives a tractor airscrew in addition to the air compressor. The surplus heat energy from the turbine produces a thermal jet at the rear to augment the airscrew thrust. This particular type of combination power unit is in a comparatively early stage, but will undoubtedly enjoy a very important future.

The arrangement of the two separate engines of the Ryan Fireball is creditably clean, as will be seen from the illustrations. The 1,350 h.p. Cyclone 1820-72 is closely cowled and smoothly merged with the fuselage, whilst the General Electric I-16 engine is totally enclosed in the tail and its presence is undetectable but for the jet discharge nozzle.



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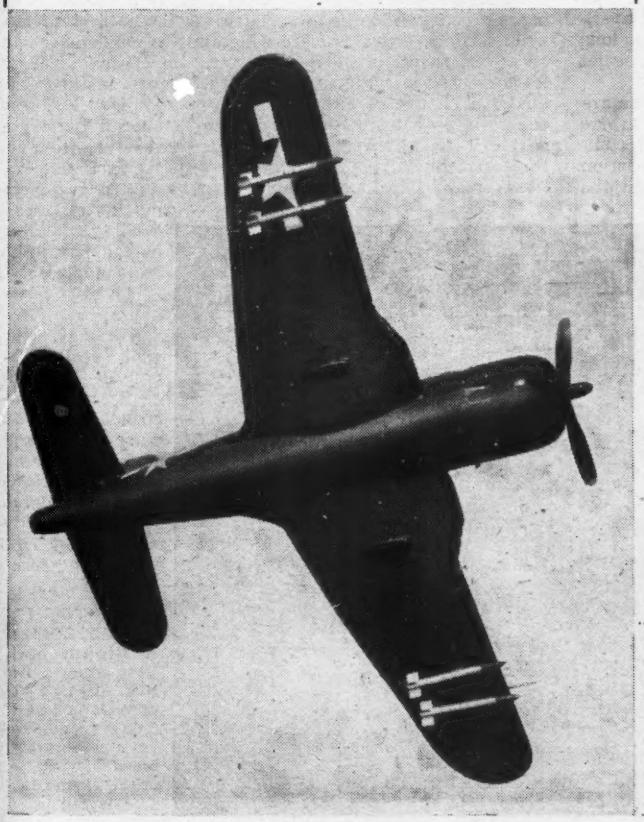


FEATHERED CLIMB: The Fireball turns to reveal the location of the four 0.5 in. calibre guns and the British-type rockets.

U.S. Naval Requirements

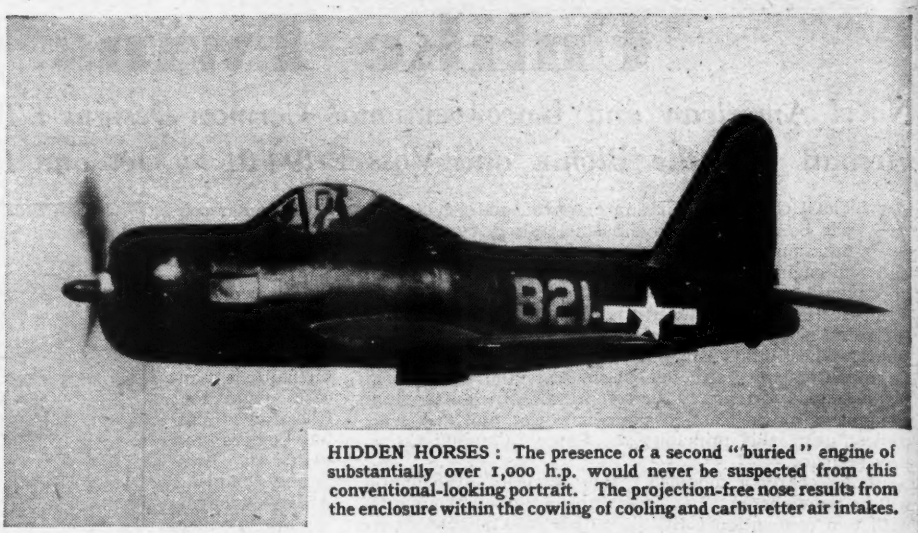
The U.S. Navy and the Ryan Company combined to produce in the F.R-1 a carrier-based fighter with first-class performance and combat characteristics together with economical cruising for duration and range. Stability and good vision for landing and simple handling on the deck were further requirements.

The Fireball can fly and land on either engine singly and, of course, gives its best performance using both in unison. The speed curve using both engines does not vary much from sea level to 25,000ft., so there would be no need to select favourable heights at which to tackle an enemy.

For cruising at all normal altitudes, the nine-cylinder Cyclone engine would be used alone. This particular mark of engine was chosen for economy and reliability and its compactness and close cowling, together with the distribution of engine weights, allows the pilot to be placed forward of the leading edge. In this way better forward visibility is obtained than if the entire power output was taken in the more normal American manner from a single large radial engine.

Flying on the front engine alone, the maximum speed of the Fireball is said to be as high as 320 m.p.h. and at a speed of 207 m.p.h. the

UNLIKE TWINS



HIDDEN HORSES: The presence of a second "buried" engine of substantially over 1,000 h.p. would never be suspected from this conventional-looking portrait. The projection-free nose results from the enclosure within the cowling of cooling and carburetter air intakes.

greatest range, 1,500 miles. The maximum speed using the jet engine alone is about 300 m.p.h., depending upon altitude and the speed at which the jet takes over alone. Naturally, none of the swing or turning difficulties associated with single-engine flying on a conventional twin are experienced.

Before VJ Day, squadron training had commenced with the F.R-1 and the use of a combination of jet and airscrew engines was expected to give the aircraft most of the advantages and few of the disadvantages of both. An unusually high-speed climb and dive have resulted and the all-metal control surfaces, among the first to be accepted by the U.S. Navy, add to manœuvrability and the lightness of handling at high speeds.

Common Fuel Supply

Two fuel tanks, of 125 and 51 gallons capacity, are carried in the fuselage, and an external, jettisonable tank of 100 gallons capacity can be mounted under the starboard wing. These three tanks feed either or both engines. Providing that sparing use is made of the jet unit, the very low percentage of the total power required and available for cruising gives the Fireball its unusually long range. The use of a common high-octane fuel for the jet as well as the piston engine is unexpected.

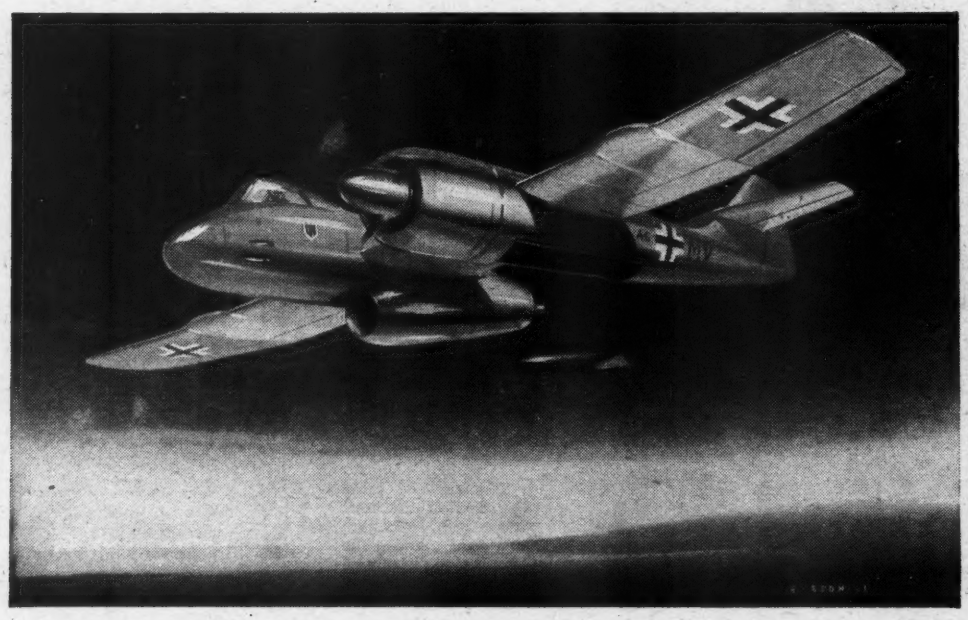
Some details of the General Electric I-16 jet engine are available. These indicate that it has a single-stage turbine driving a double-sided impeller for the centrifugal compressor. There are ten radially disposed combustion chambers. Lubrication is of the dry-sump type and the mineral hydraulic fluid used is contained in a 1-gallon tank. The engine bearings are supplied with filtered air from the compressor case to "atomise" and distribute the oil.

The starting equipment comprises a 24-volt, 200 amp. motor working up to 600 r.p.m.; two separate sparking plugs with booster coils and a mechanically driven spur-type fuel pump.

The power output is said to be about the same as for the front engine, namely, 1,350 h.p., but the Cyclone is more than twice as heavy.

Already several desirable features from the point of view of carrier operation have been mentioned. In addition to these, maintenance has received careful attention. The pear-shaped fuselage is designed to be separable into two main sections just aft of the wing and the empennage can be replaced without the need to re-rig the controls. These features used in conjunction with the tricycle landing gear render a change of either engine very simple. The rear engine is provided with a supporting monorail trolley to enable it to be rolled forward prior to removal from its three attachment points in the rear fuselage section. The front engine has four attachment bolts and a two-piece quick-release cowling. Either engine is said to be replaceable within four hours.

Although the wing section is not deep, sufficient room has been found to place guns and ammunition well inboard towards the roots in spite of hydraulically operated wing folding and lock-



OFFSET AND UNDERSLUNG: A Blohm and Voss project, the B.V. P-194 01 two-engined fighter combines jet and airscrew propulsion in a most unusual layout.

Technical Development

ROLLS-ROYCE GRIFFON

SERIES 130

THREE-SPEED SUPERCHARGER

No. 1 "Power all the way up" is how the latest development of the "Griffon" series of engines has been described. The incorporation of the new 3-speed supercharger provides higher combat ratings at the intermediate altitudes, and its increased capacity gives higher power at higher altitudes.

The latest "Griffon" Series 130 engine already develops 2420 B.H.P. in L.S. gear at 5,000 feet, 2250 B.H.P. in M.S. gear at 14,500 feet, and 2050 B.H.P. in F.S. gear at 21,000 feet.

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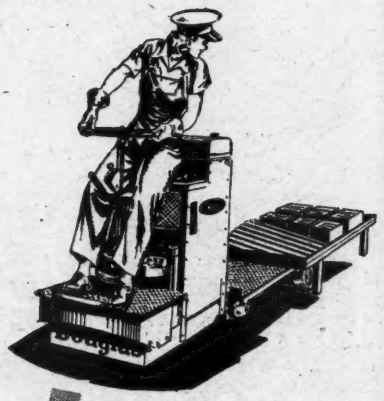
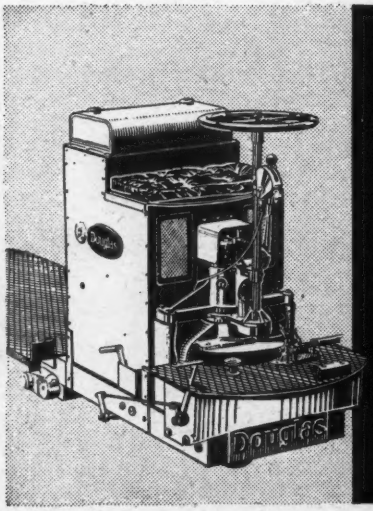
As essential to the modern factory layout as Light.. Power..Materials..Labour



mechanical handling



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UNLIKE TWINS

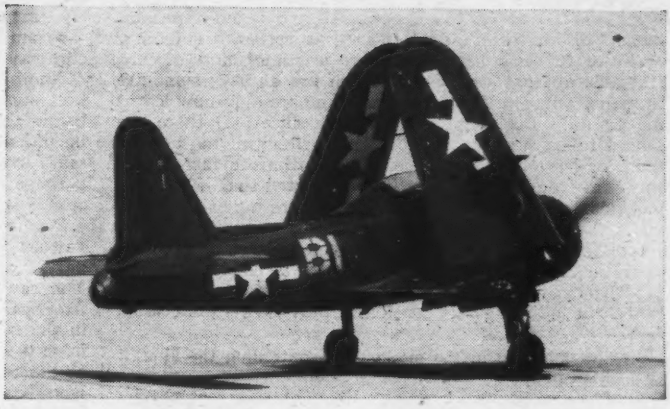
ing mechanism, undercarriage gear and the air intake ducts for the rear engine. To a large degree this is made possible by retracting the wheels outwards into the main folding sections of the wing. An additional advantage of this layout is found in the accessibility of the guns for servicing with wings folded.

In addition to the four 0.5in. Browning guns carried in the wing roots, four rockets may be carried on detachable mountings on the outer wing sections. Provision is also made for two 1,000 lb. bombs to be slung under the wings.

Unlike the Ryan Fireball, which is of quite conventional appearance, to most people the Blohm and Voss P-194 01 fighter/bomber is unconventional to the point of being grotesque; yet it is only one of many similar types on the drawing boards of this well-known manufacturer at the cessation of hostilities.

On close examination and in spite of the asymmetric layout, the protrusions in the wings for landing wheels, the odd pairing of engines and the square aspect of wing tips and tail units, this aircraft has smoothness and a certain grace. It has a wing span of 50ft. 2in. and a length of 38ft. 7in.

Among the advantages claimed for the unusual design are good visibility for the pilot, concentration of armament without interruption by the airscrew arc and internal bomb stowage behind the piston engine.



STRANGE BIRD: With neatly folded wings and jet nozzle at the rear indicating the contents of the fuselage, the two-engined Fireball with its squarely placed tricycle undercarriage is seen to be well suited for carrier-based operation.

The piston engine specified for the P-194 is the B.M.W. 801D fourteen-cylinder radial, which develops 1,580 h.p. at 3,000ft. This unit is fitted with an exhaust-driven turbo-blower. The jet engine slung under the pilot's nacelle is a Jumo 004, which gives a static thrust of 1,980 lb.

All four cannon—two 20 mm. MG 151/20s and two 30 mm. MK 108s—are grouped in the nose of the pilot's nacelle. In addition to these a bomb load of up to 2,000 lb. can be carried.

American Newsletter

P-80 Speed Record Possibilities : Private-flying Flood : The Douglas "Mixmaster" : Opportunity for Britain

By "KIBITZER"

THE capture of the world's speed record by the Meteor seems to have created more of a stir in the American aircraft industry than appeared on the surface. At the time it was made, there was a sort of "so what" attitude, but it seems this was for outside (and American public) consumption only.

Apparently the trade is putting considerable pressure on the U.S.A.A.F. to get them to try to recapture this record, and thereby hold both it and the long-distance record at the same time. The Air Force, however, is said to be against such an attempt at the moment, and this may be due to the fact that the P-80 has not shown up well at high Mach numbers, and that further research is necessary before it can be ready to tackle such high speeds as will be required to get the record under the F.A.I. low-altitude conditions.

It also seems likely that those who, in the past, have been loudest in their statements regarding the very high speed of this machine have found their exaggerations bouncing back on them. A few weeks ago, for instance, it was being rumoured that a P-80 had done 714 m.p.h. on an unofficial run. The natural reaction was that if that was the case, why hadn't the record already been recaptured by America?

Anyway, one would guess that special P-80 aircraft, designed for an attempt on the speed record, are probably in existence and perhaps flying, but that a considerable amount of preparatory work will be done by the Air Force at Muroc Lake before anything official is said. It is known that some of the compressibility troubles previously experienced on this aircraft have been cured by modifications to the wing-root air intakes, so that any future attempt in this country might well be successful. Any machine that can exceed the present record at its high sea-level Mach number will be a good one.

✦ ✦ ✦

Allison's are making a determined attempt to get into the civil aircraft field. T.W.A. are reported to be interested in an Allison-powered DC-6 and to be investigating the possible installation of this engine in the DC-4. This latter rumour doesn't make a lot of sense, however, as the DC-4 is admitted as obsolete and the engineering work necessary for such a radical change in power units would not only be very great, but would take much time. To start with, anyhow, Allisons will be fitted into the DC-8, although the final conversion of this machine to jet seems certain.

✦ ✦ ✦

The small four-seater tricycle-undercarriage, commercial aircraft that is being built by North American at Inglewood, California, should now have flown. The four seats are two and two, under a bubble canopy, and the general outline of the machine bears a strong resemblance to its famous predecessor, the Mustang. If it is successful and the Company decide to go into production, the idea is to build something in the neighbourhood of 10,000 machines over the next two years. At present the power unit is a 165 h.p. Continental, but this may be changed if the 200 h.p. General Motors engine proves successful.

✦ ✦ ✦

The Government has now sold over 15,000 surplus light aircraft to dealers or private owners throughout the United States. These sales will merely swell the flood of small aircraft which are expected to spill out during 1946 and

which are the answer to the dammed-up demand of private owners of all sorts. This outlook is rather frightening. Many of the would-be owners are wartime pilots of considerable ability; some are pilots of less ability; some are probably outright dangerous and some are only now learning to fly. But whatever their classification, there are bound to be a great many of them who will be nothing more or less than a menace. One optimistic member of the Aero Insurance Underwriters predicted that if the pre-war accident curve was maintained, there might, in a few years, be 300,000 private flying deaths annually! At a recent Joint Private Flying Conference in Washington, considerable time was devoted to discussing methods for reducing the expected accident rate. Amongst other suggestions, the following very sensible improvements were called for:—

(a) Simplification in the methods of controlling the aircraft both in the air and on the ground.
(b) Introduction, so far as possible, of spinproof characteristics.
(c) Better visibility at all times.
(d) More accessible fuel strainers.
(e) Redesigned interiors, instrument panels, controls, etc., to avoid injury to the occupants during a crash.

✦ ✦ ✦

The Douglas "Mixmaster"—the aircraft with contra-props in the tail—has been making news lately, both good and bad. It established a satisfactory record on a Los Angeles to Washington non-stop run, then crashed a few days later in circumstances which are, so far, unexplained. The pilots reported trouble, and are alleged to have made an abortive approach and then to have baled out, having first jettisoned the propellors by means of the explosive bolts. Subsequently, the Allison Engine Company issued a statement that an examination showed there was nothing wrong with the engines. As published, and carried to its logical conclusion, their statement appeared to put the blame either on to the Army pilots or the airframe. At the time of writing, neither Douglas nor the U.S.A.A.F. have made any further comment, but it is rather a strange state of affairs when the engine manufacturers of a purely military aircraft get up and publicly say. "Please, it wasn't us." This situation arises largely because U.S. military aircraft are often used to establish domestic records, from which the manufacturers may make advertising capital.

Although a similar situation has existed in England since 1920 in connection with world record events, the writer has always felt that, financial considerations notwithstanding, it is undignified for the air force of any country to become a party to the purely commercial side of such flights. But it is probably good for trade.

Nickname

To get back to the "Mixmaster," this machine is the military forerunner of the civil DC-8, and is so called because, having two contra-rotating propellors behind the tail, it has some resemblance to a well-known domestic mixing machine which has two electrically driven contra-rotating fans that are guaranteed to mix anything from cocktails to chocolate milk-shakes. In actual practice, this aircraft is of great interest, and the piston-engined civil version may well prove to be the most efficient medium-weight (34,000 lb.) machine yet designed.

It has a tricycle undercarriage and a beautifully smooth, laminar-flow wing, and "bug-eyes" are employed for the two pilots. (This latter feature isn't very popular and may be dropped.) The performance is high, and the fact that the two Allison engines are situated in the fuselage, with a shaft drive to the tail, makes the single-engine performance particularly good.

An interesting point on the military version is the undercarriage and its method of retraction, which is designed to avoid housing the wheels in the thin wing. The widely splayed undercarriage legs and the wheels fold back and into the fuselage, and the wheels come to rest some distance aft of the trailing edge, so that there is a very great difference in position between the folded and extended positions—so much so that there must be a considerable change in c.g. travel, and, therefore, of trim.

Another point which strikes an observer is the amount of keel surface aft. The fin and rudders, both above and below the fuselage, are quite large, and to these should be added the fin area of the propellors. Directional stability must have been quite a problem in the design stage and perhaps during the initial test flights.

✦ ✦ ✦

The appointment of S.B.A.C. representatives to the various trade areas of the world, and to South America particularly, has created quite a lot of comment over here. The news that Mr. F. W. Ballantyne was to go to South America was of sufficient importance to warrant comment in the New York dailies, and some of the aviation papers have used it as a stick with which to have another whack at the State Department in Washington. Although those who have tried to sell British aircraft abroad will not always agree, the American manufacturer considers that the British authorities give far more assistance to our sales representatives abroad than the State Department does to theirs, and there is quite a discussion going on at the moment on this and kindred subjects.

AMERICAN NEWSLETTER (CONTINUED)

✦ ✦ ✦

American Airlines have announced their choice of a successor to the DC-3. This is to be the Consolidated-Vultee Model 240 (which is presumably a modification of their Model 110). This is one of the most important things that has happened for some time in the domestic field of American aviation. To some it is certainly a surprise, but it is an order that may have far-reaching results.

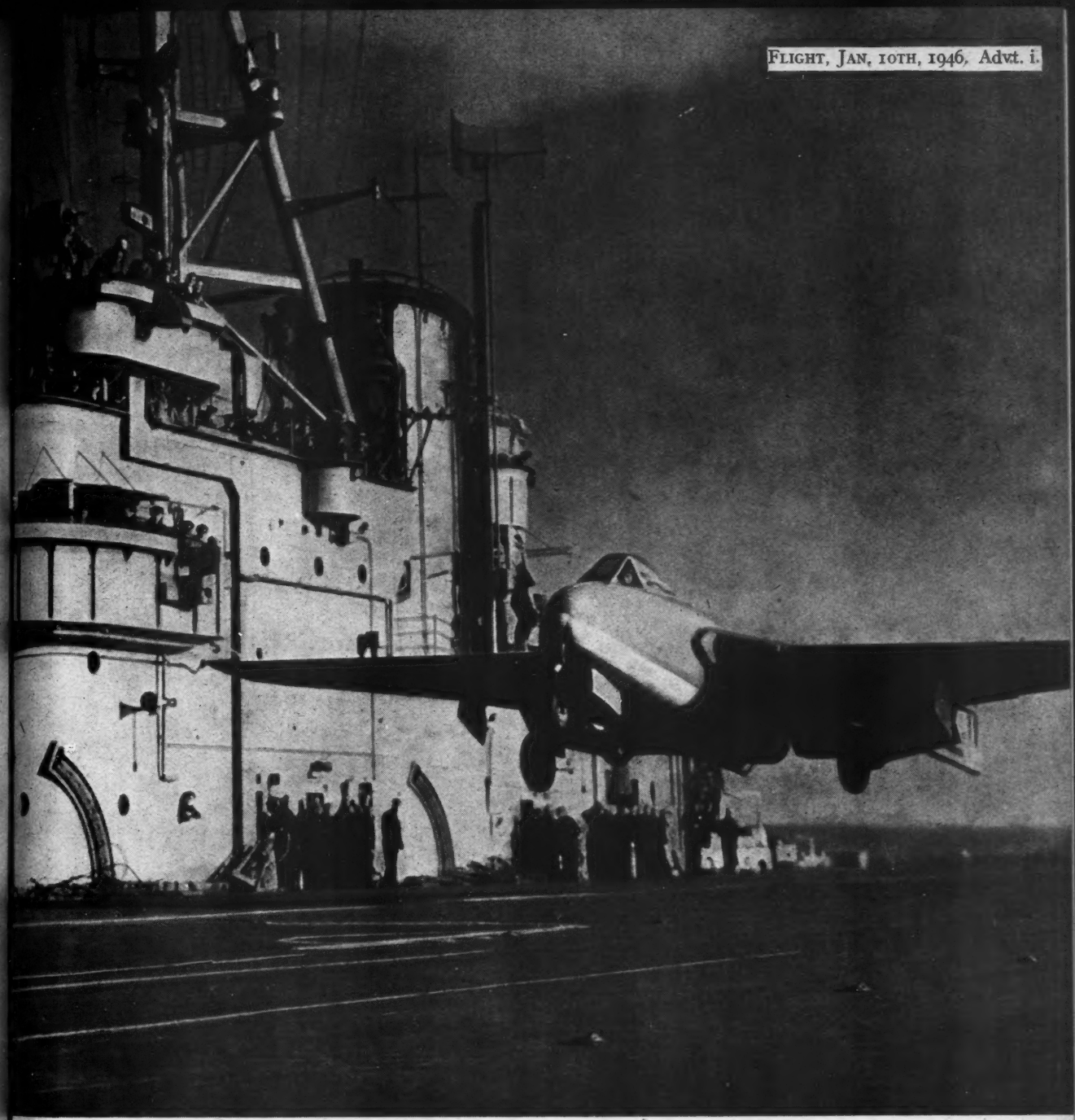
For some time now there has been much speculation on the outcome of the American Airlines "competition" for a replacement aircraft for their existing short-haul equipment. At one time those of us here with British interests at heart wondered whether the Airspeed Ambassador would not be a possible starter. Except for the fact that it was a little big for the 500-mile hops that constitute the majority of the internal routes of the American Airlines system, it appeared to have everything required.

Opportunity

However far-fetched the possibility of supplying British equipment to an American airline may seem, it is known that American Airlines are one of the smartest and most independent operators in the business, and that if they felt an aircraft was technically what they wanted, they might well buy it, even if it wasn't built on their own side of the Atlantic. In any case, for 800-mile hauls, the Ambassador looks one of the best aircraft yet, and it is to be hoped that Airspeeds will institute a really aggressive programme of sales promotion, not forgetting the North American Continent.

So far as the Consolidated 240 goes, it is not known yet whether this is identical with the Model 110 or not. It is apparently still in the design stage and is said to be selling for 180,000 dollars, as opposed to the 200,000 dollar price of the Martin 202. Published artists' impressions show a twin-engined, low-wing monoplane with some 38 seats, powered by Pratt and Whitney R-2800 engines. Exact performance is not stated, but use is to be made of the exhaust gases for auxiliary jet propulsion. A good deal of newspaper blurb is being tied around this feature, and an addition of 20 m.p.h. to the cruising speed is claimed. As this cruising speed is given as about 300 m.p.h., it seems hardly likely that this thrust can give such a big increase in a basic 280 m.p.h.

The newspaper sketches show a wing that is very reminiscent of that fitted to the B-24 and B-36, with what appears to be the same proportion of span to chord to taper. If this is so and it has the same sections, it is to be hoped that some of the troubles which were experienced on those aircraft and their variants will not appear on the 240.



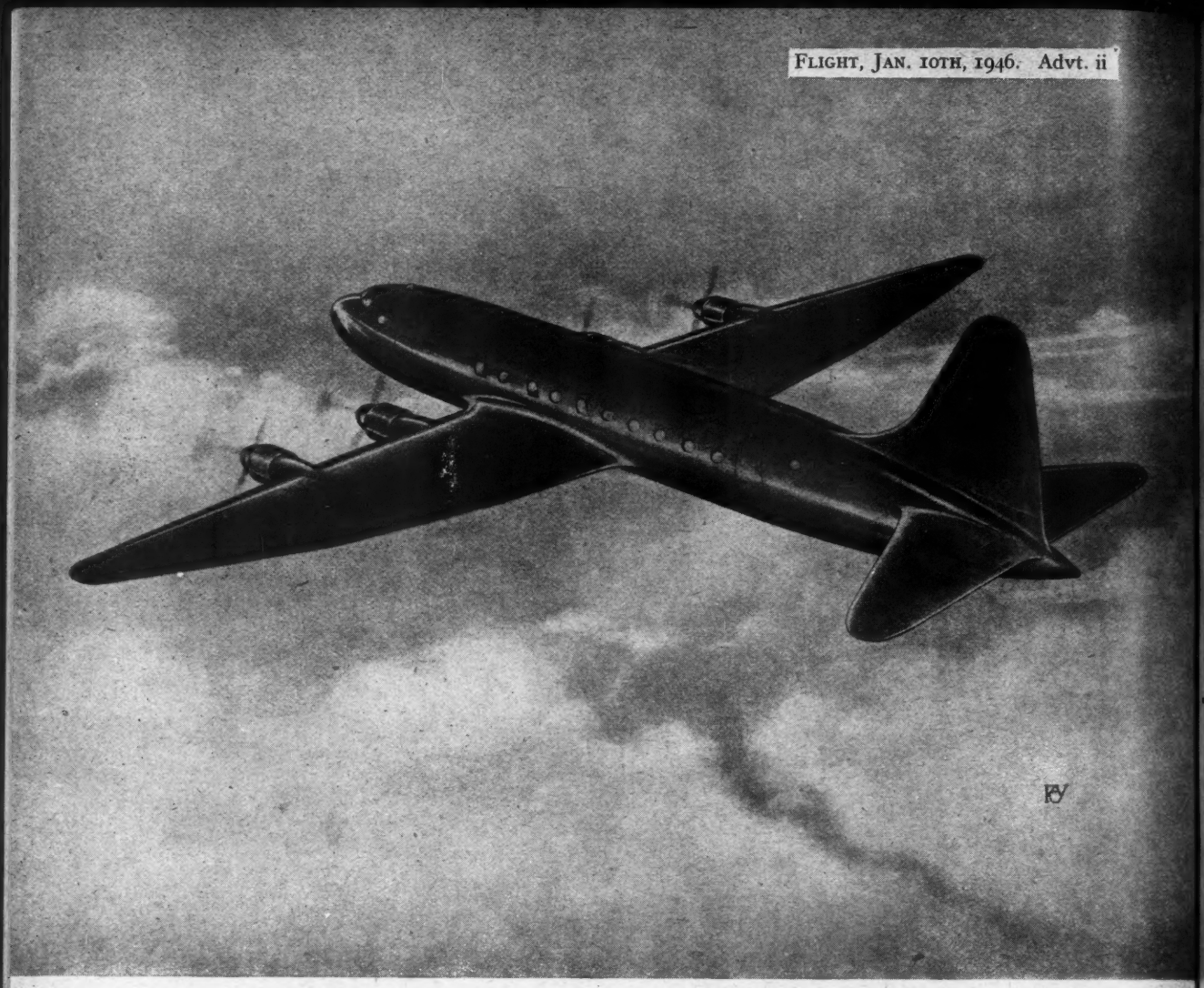
H.M.S. OCEAN off the Isle of Wight, December 3, 1945 — *Photograph by Chas. E. Brown*

The first jet aircraft to land on
and take off from an aircraft carrier

DE HAVILLAND VAMPIRE

D H AIRCRAFT

D H ENGINES



HERMES

HANDLEY PAGE

HANDLEY PAGE LIMITED, LONDON, ENGLAND

HERE AND THERE

Norwegian Nucleus

BRITISH aircraft will be the mainstay of the Norwegian Air Force which requires a total of 187 machines to equip a nucleus of six squadrons.

At present the N.A.F. has 35 Spitfires, ten Mosquitoes, ten Sunderland flying-boats, and three Catalinas.

Radar Recommended

USE of radar by aircraft for the detection and avoidance of dangerous clouds in thunderstorm areas to minimise the danger of collision with other aircraft is recommended in the Montreal report of the Communications Committee of the Provisional International Civil Aviation Organisation.

Recommending the use of radar on large transport aircraft, the report points out that such equipment would also be an aid to navigation without visual reference to the ground.

N.E. Coast Exhibition

THE National Trades Technical Societies, whose address is St. George's Square, Sheffield, 1, is staging a North-East Coast Exhibition of Scientific and Engineering Inspection Equipment at Newcastle-on-Tyne from Feb. 12th to Feb. 22nd. It is to be held in the local drill hall in Northumberland Rd.

A particularly interesting exhibit will be the British electron microscope which magnifies 50,000 times, while the National Physical Laboratory and the Naval Ordnance Inspection Dept. will show—and in some cases demonstrate—examples of their latest and most accurate equipment.

Power-Assisted

AN ultra-light, low-powered two-seater, described as a "powered glider," is reported to be undergoing tests in California and is expected to be marketed in due course at a price not exceeding £250 by Nelson Aircraft Corporation.

The little engine is a 16 h.p. "pusher" air-cooled two-stroke of the "flat-four" type, and the machine is said to take-off at 38 m.p.h., cruise at 75 m.p.h. and climb at 300 ft./min. Its three-gallon fuel tank gives a duration of 1¼ hr. at full throttle, empty weight is 465 lb., and passenger load allowance 350 lb.

The glider characteristics are indicated by a span of no less than 47ft. for an overall length of 23ft. and a height of 5ft., so, even allowing for a fairly high aspect ratio, wing-loading would be extremely low, possibly in the region of 4 lb./sq. ft.

Another feature is the retractable undercarriage (manually operated), and it would seem that, under reasonably favourable conditions, soaring flight should be possible, which, doubtless, was the designer's intention.

INAUGURATION: Lord Winster formally opening Heath Row airport before A.V-M. Bennett took off for the first civil flight (reported elsewhere in this issue). Next to the Civil Aviation Minister "at the mike" is A.V-M. Bennett in mufti, and, end but one, Miss M. S. Guthrie, ex-A.T.A. pilot, the first air hostess of British South American Airlines.

Carried Forward

IT is good to see the team spirit, which was so strong in R.A.F. squadrons during the war, being carried on in a practical way into peace.

An excellent example of this is provided by No. 603 (City of Edinburgh) Squadron—one of the first of the old Auxiliary Air Force squadrons to meet the *Luftwaffe* over Britain—which started its own benevolent fund during the war; subscriptions, mainly from Edinburgh citizens, now exceed £5,000, and the fund is being administered by recently appointed trustees.

A "603 Squadron Association" is being formed right away, but already an advisory committee has been set up by newly demobilised personnel to help other wartime comrades on their return to civil life, and has already tackled requests from some of the ex-airmen who cannot find homes.

That, emphatically, is the right spirit.

B.T.H. Progress

TECHNICAL developments and wartime products of the British Thomson-Houston Co., Ltd., set forth in some notes just issued by the firm include some important contributions to aviation.

There was, for example, the initial development work on the Whittle jet engine, and it was a unit built by this firm which was sent to the U.S. in 1941 for the General Electric Co. of New York to study and copy.

Radar was another sphere in which this British firm played an important role, while among their wartime munition output were thousands of bomber parts, aircraft magnetos, cameras, servo-motors and other electrical equipment.

At the present time work is proceeding on the development of gas turbines for land and marine application where moderate power is demanded.

News in Brief

The School of Aircraft Recognition has been absorbed into the School of A.A. Artillery at Manorbier, Tenby, Pembrokeshire, and becomes the Aircraft Recognition Wing there.

* * *

Mr. C. A. Oakley, B.Sc., M.A.P. Regional Controller (Scotland), will address the Glasgow branch of the Royal Aeronautical Society on Thursday, January 17th, in the Royal Technical College, Glasgow, at 7.30 p.m., on "History of the Aircraft Industry in Scotland."

* * *

The Imperial Defence College is to be reopened, and the first post-war course, to begin next spring, will be attended by representatives of the three fighting Services, the civil defence, the Dominions, and India. Gen. Sir William Slim has been appointed Commandant, and Air Vice-Marshal Sir Hugh P. Lloyd will be Senior Instructor for the air personnel.

According to Major Cortez F. Enloe, U.S.A.A.F. surgeon who edited the Medical Branch report of the U.S. strategic bombing survey, the fire effects of the atomic bomb on Nagasaki "were not nearly as bad as the effects of the R.A.F. raids on Hamburg on July 27th, 1943." After this triple strike, he said, Hamburg burned out of control for six weeks with a death roll of more than 40,000.

* * *

Wing Cdr. Barrie Heath, who has served in the R.A.F. throughout the war (he gained the D.F.C. as a Spitfire pilot in the Battle of Britain), has now been released from the Service and has been appointed to the board of Hobourn Aero Components, Ltd., Coventry.

* * *

The Manchester office of George Salter and Co., Ltd., has now been re-opened at 131, Corn Exchange Buildings (Tel.: Blackfriars 8551) under the management of Mr. A. Tonks.

Rolls-Royce

New Version with Three-speed Blower Existing Installation Clearance

THOUGH basically similar to the Rolls-Royce Griffon 65 engine (described in detail in *Flight* of September 20th), the Griffon 130 differs from the earlier model in having a three-speed, two-stage supercharger and a Rolls-Royce fuel-injection system to replace the Bendix-Stromberg wartime installation. These two innovations are to be regarded as important technical advances in that they enable over 2,000 b.h.p. to be maintained to 20,000ft.—a most remarkable performance for an engine of only 37 litres capacity.

These new developments are embodied in a new series of Griffon engines starting at "101" through Series "121" up to "130," all being under the designation "Griffon 3 SML" to denote that the supercharger incorporates a three-speed gear. Series 101 engines will be fitted with a reduction gear of 4.45 ratio for a single airscrew and Series 121 and upwards with 0.44 ratio reduction gears for contra-rotating airscrews.

It will be appreciated that the object of having alternative driving speeds for a supercharger is to enable the greatest power to be developed from the throttled sea-level power in M.S. gear up to an altitude at which the throttle is fully open and the maximum power is being delivered. Similarly, when F.S. gear is engaged, the engine is again throttled until the rated altitude in this gear is reached. The respective ratios determine the sea-level and altitude performance of the engine, the M.S. ratio being a compromise between sea-level and medium-altitude power, whilst the F.S. ratio is designed to give optimum power at higher altitudes.

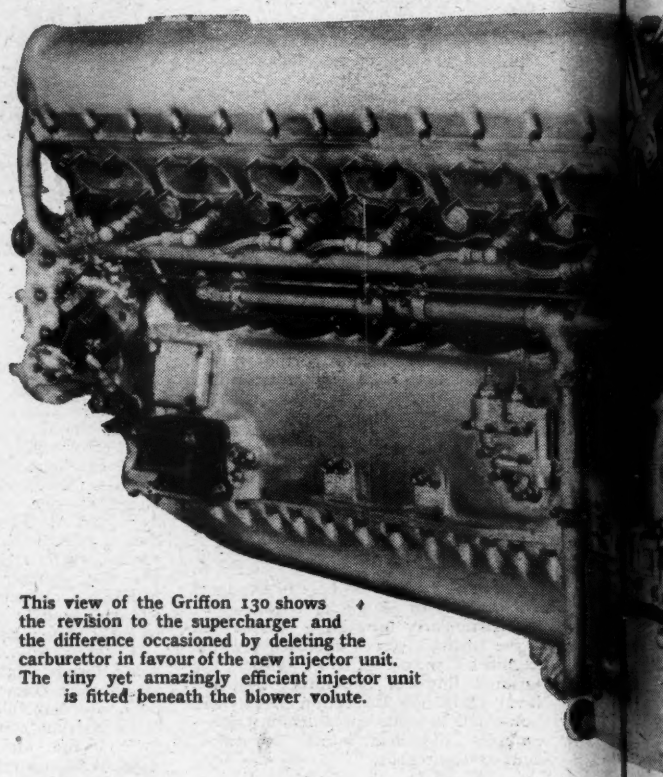
Performance Increased at all Levels

There must, however, necessarily be a transitional stage between the peak point of M.S. power and the altitude where F.S. gear can advantageously be used, where the power of the engine falls, due to the compromise in the selection of drive ratios. This unfortunate transitional stage is somewhat negatived by the three-speed blower, for not only does this refinement increase the power at medium altitudes but it also improves the performance at sea-level and, additionally, makes available increased power at higher altitudes, one engine thus becoming suitable for sea-level, medium-altitude and high-altitude operation.

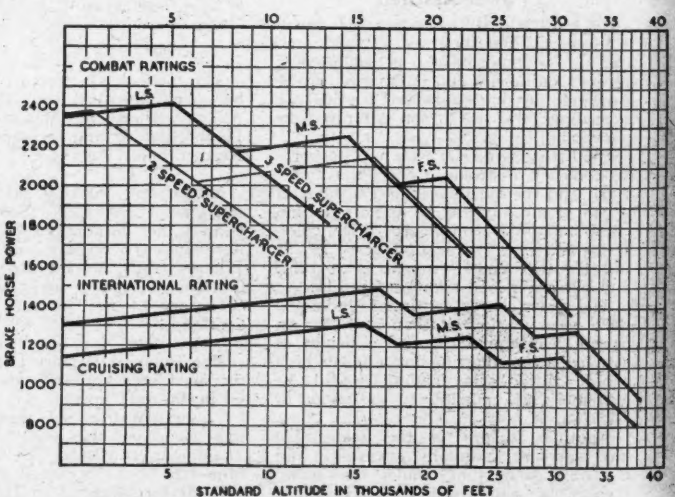
In this connection, whilst we must agree that it is an excellent thing to have the greatest possible output both for take-off and at extreme altitude, we trust that the advent of this new engine does not presage the passing of the specialist, single-purpose aircraft. It is, we feel, by far the better plan to provide both low-altitude and high-altitude machines rather than attempt to make one aircraft perform both functions.

It is interesting to compare the combat rating power curves for the three-speed Griffon with those of the earlier two-speed engine. These show that the rated altitude on the latter engine in L.S. (low supercharge) gear is 5,000ft. as against 1,250ft. in M.S. gear on the two-speed engine. In M.S. gear the rated altitude for the Griffon 130 is 14,500ft., and is, therefore, only short of the F.S. rated altitude on the two-speed Griffon by 1,500ft., whilst in F.S. gear the three-speed engine has increased the rated altitude to no less than 21,000ft., representing a gain of some 5,000ft.

Similar approximations to the ideal are obtained for maximum climbing and cruising conditions. In L.S. gear at climb rating, the



This view of the Griffon 130 shows the revision to the supercharger and the difference occasioned by deleting the carburettor in favour of the new injector unit. The tiny yet amazingly efficient injector unit is fitted beneath the blower volute.

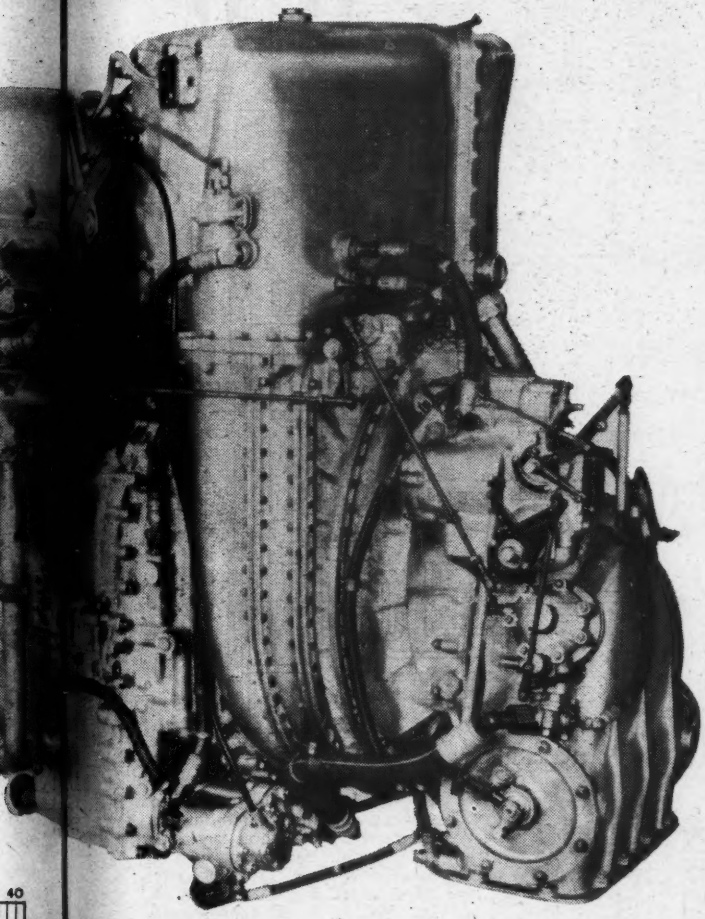


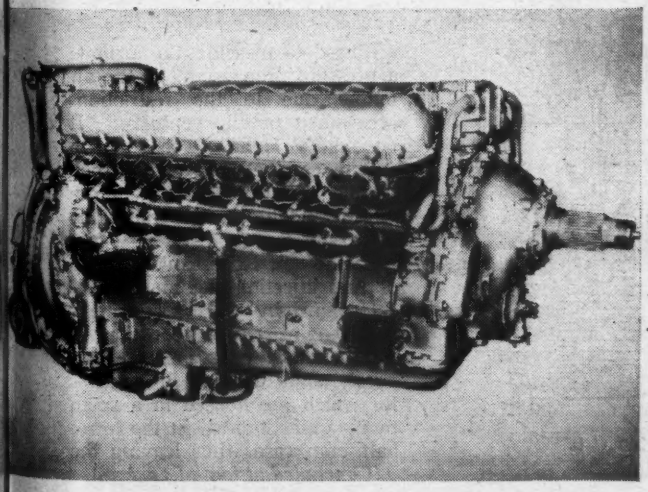
These power curves show how closely maximum power is attained throughout the operating range

Griffon 130

Over 2,000 B.H.P. Developed at 20,000 ft.

Unchanged : New Fuel-metering Pump





It is apparent from this and the above photographs that the external changes are confined to the rear end of the engine.

Griffon 130 has a rated altitude of 16,500ft. as against 13,500ft. for a two-speed engine. In M.S. the rated altitude is about the same as for the 65, but for that altitude there is an increase of more than 50 b.h.p., whilst in F.S. gear the output has gone up to 1,280 b.h.p. at 31,500ft., which is the greatest altitude power figure so far produced by a piston engine at climbing conditions.

When modifying the basic design of the two-stage Griffon, existing installation clearances had to be maintained if the new engine was to power extant fighter aircraft. The arrangement of the third drive to the blower was relatively simple, as the deep wheelcase sump permitted some degree of latitude. The problem of increased supercharger capacity was not so simple. However, by making good use of all the available space within the blower casings, in addition to improving internal detail design, an increase in the first and second stage impeller diameters was found to be possible without alteration to the outside diameters of the casings. As a result of these modifications, an increase in supercharging efficiency was also obtained.

By virtue of careful design, the three-speed blower has incurred a weight penalty of only some 40 lb., whilst the complete engine weighs 2,100 lb. With its maximum output of 2,420 b.h.p., the Griffon 130 is therefore between 500-750 lb. lighter than any other equivalent engine. Power-weight ratio of the engine is 0.865 lb./b.h.p., and it is this quality which enables a rate of climb of 6,000 ft./min. to be achieved when installed in a fighter aircraft—a greater rate of climb than that obtainable from any comparable engine.

Change-speed Mechanism

The method of engagement of M.S. or F.S. gear is the same as that on the Griffon 65, but provision has been made in the 130 series to hold the flyweights in a neutral position when L.S. gear is required. The arrangement of the three-speed blower drive mechanism is shown in the accompanying diagrammatic illustration. To engage M.S. or F.S. gear from the neutral L.S. position, the flyweights are moved by the hydraulic operating mechanism from the neutral position to engage the gear selected, and, as both ratios are higher than the L.S. ratio, the latter is overrun and the drive allowed to free-wheel.

The free-wheel mechanism comprises an outer and inner member and multiple rollers retained in a cage, the inner member being splined to form part of the layshaft and having on its periphery a series of ramps or inclined faces corresponding to the number of rollers. The outer member is essentially a roller bearing race integral with the inner splined member of the centrifugal clutch.

In action the free wheel is such that the drive being through the L.S. layshaft of the inner member, the rollers are forced to run up the ramps, and a solid drive is formed by the wedging action of the rollers against the outer race. When overrunning, the relative speed of the outer member being higher than that of the inner, the rollers are free to rotate and, additionally, are positively held in the free position by means of stops on the roller cage engaging with dogs on the inner member. A clutch is embodied as a safeguard for the free wheel against shock loads, and is designed to slip should the torque loading become momentarily excessive.

With the introduction of the three-speed gear, it was necessary to modify the reciprocating hydraulic ram used to effect the change from

ROLLS-ROYCE GRIFFON 130

M.S. gear to F.S. gear. On the Griffon 130 the ram is housed in a separate unit in the wheelcase, and is linked by control rods to a sliding sleeve in the hollow shaft of the supercharger drive. Engagement of the L.S. gear is by movement of the controlling piston in the ram to a position of equilibrium which corresponds to the neutral plane of the flyweights. Thus when L.S. gear is engaged through the free wheel, both M.S. and F.S. are in a neutral position. The ram is retained in the intermediate position by permitting the oil to flow without restriction to one side of the differential piston and then through a transfer port to the other side, where it is allowed to drain away through a drain port. In the event of the piston becoming biased one way or the other, either the transfer port or the drain port will be partially cut off according to the way in which the piston has moved, and a build-up in pressure will occur which will return the piston to the neutral position and so restore equilibrium.

Oil Control Valves

The supply of oil to the ram is controlled by two oil-control valves actuated by solenoids. As shown in the diagram, the valves have separate positions for each ratio, and the solenoids are only energised when L.S. or F.S. gear is engaged. When M.S. gear is engaged, each control valve is held in the downward or M.S. position by a light spring.

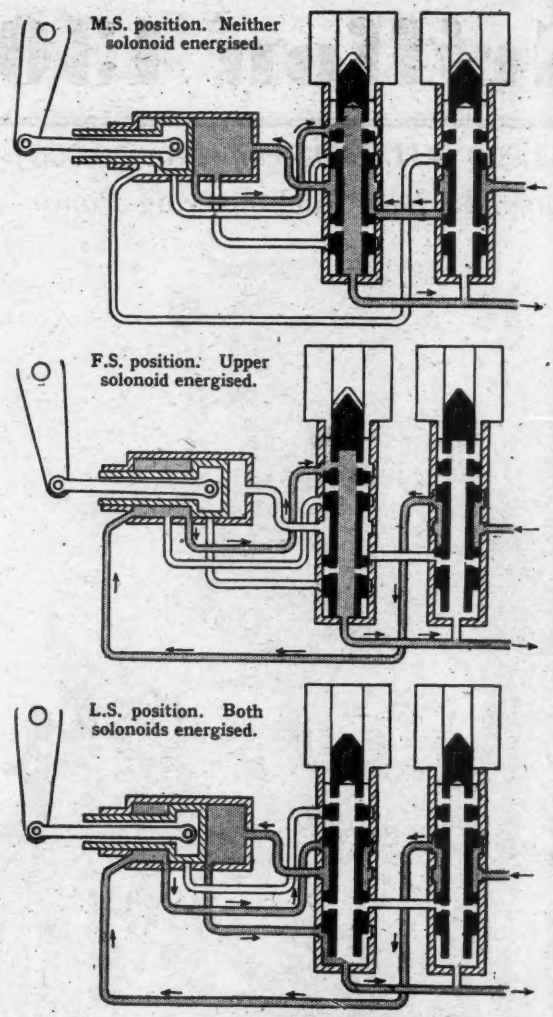
The arrangement of the change-speed mechanism has been designed to provide the maximum precaution against failure and, at the same time, avoid additions to the already numerous controls required on military aircraft; each ratio is automatically brought into engagement with increase in altitude. The solenoids are placed in series and are controlled by on-off switches which are operated by sealed capsules, the capsules expanding as atmospheric pressure diminishes. Capsules and switches are so arranged that at sea-level the switch controlling the solenoid for L.S. gear is closed and the switch controlling the F.S. solenoid is open, both solenoids being energised. At a predetermined altitude the capsule for the L.S. gear opens its switch, the F.S. switch also remaining open, and, as neither solenoid is energised, the oil-control valves are moved by the light spring above each valve to bring the ram to the M.S. position. Further increase in altitude results in expansion of the second capsule, and the second switch is closed, bringing the F.S. gear into engagement. The arrangement of the electrical circuits ensures that, in the event of failure of either aneroid, it is still possible to obtain two ratios.

When the review of the Griffon 65 was given, mention was made of the existence of the Rolls-Royce fuel-metering pump, and this unit is now used on the Griffon 130 to complement the new supercharger.

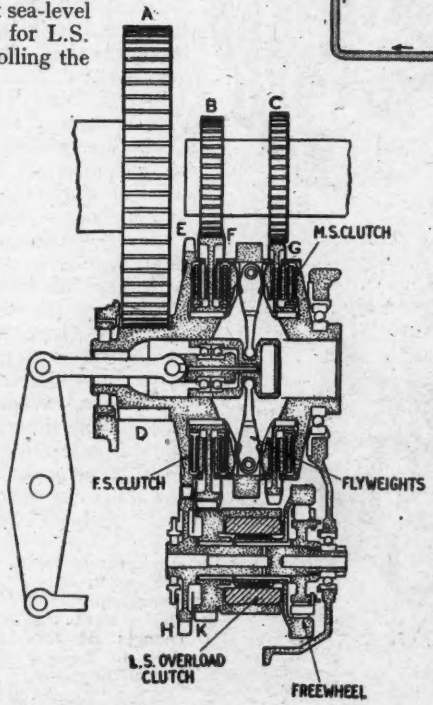
In any form of pressure velocity control in which venturis are used to measure the airflow, a pressure drop occurs in the air intake due to the restrictions occasioned by the venturis. It necessarily follows that if a system can be evolved in which the air intake is unrestricted, an improvement in supercharging will result.

In the new Rolls-Royce system of fuel injection the metering is determined by four variable factors, engine r.p.m. boost pressure, exhaust back pressure and boost temperature, the controls for which are housed in a small pump unit mounted in the lower half crankcase, thus leaving the

(*Concluded at foot of page* 38)



Above: Diagrams of oil control valves and actuating ram for gear selection in the three positions. Below, left: Section through 3-speed drive unit. The respective drive trains are, Low Speed=A, DE, HK, F, B; Medium Speed=A, DG, C; Fast Speed=A, DF, B.



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Heathrow Airport

"Flight" photograph.

The Lancastrian *Star Light* stands on the parking area and in front of it is the temporary passenger reception building. The taxitrack connects the area with the main runway seen on the right.

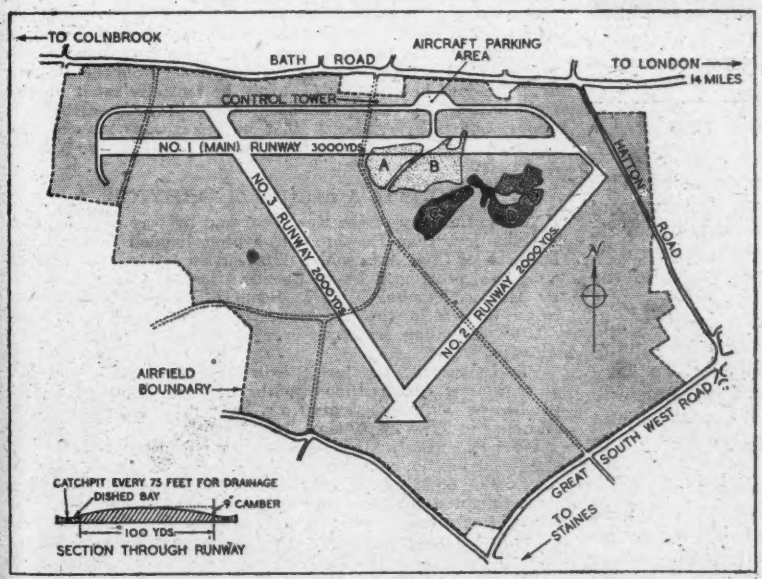
The Ministry of Civil Aviation Takes Over London's New Civil Air Terminal : Promise of Large-scale Use by Midsummer

ON New Year's Day, Heathrow, London's new civil airport, was transferred by the Air Ministry to the control of the Ministry of Civil Aviation, and for the first time the public was allowed to see how a little of the ultimate cost of this airfield—estimated by some as anything up to £25,000,000 for the complete project—is being spent.

The Minister for Civil Aviation, who was present at the opening ceremony, declared that Heathrow had the finest runway in the world and should develop into the world's best airport.

So far as one could tell on a cold and misty January morning, the 3,000 yards of concrete to which he referred forms as good a runway as has ever been seen, and there is no doubt that the potentiality of the airfield itself is tremendous. Unfortunately, it is still virtually in the embryo stage.

The site lies within the triangle formed by Hounslow, Staines and Colnbrook, and is about 14 miles from London. The site was formerly agricultural land and is level. It did, however, include 70 acres of gravel pits, and these had to be reclaimed. This work alone necessitated the pumping out of 1,000,000 gallons of water, plus the removal of 6,000,000 cubic yards of silt, in order to find a hard bottom before the pits could be filled. Perhaps "filled" hardly describes a process which involves the depositing of 9in. layers of gravel, each layer, in turn, being scientifically compacted to almost the same density as the natural gravel which had been taken from the pits, until the present consolidation of the ground is such that all reasonable risk of subsidence has been obviated.



A diagram of the initial airfield layout. The roads shown in dotted lines have been engulfed by the airfield. A, B, C and D indicate the position of gravel pits, of which A and B have already been reclaimed.

It will be seen from the diagram of the airfield that, originally, four such gravel pits existed. Water from "A" and "B" had to be pumped into "C" and "D" before consolidation of the ground or construction of the main runway could be begun, and there the water will remain until the main outfall sewer can be constructed. This outfall has to be capable of carrying all normal rainfall from the airfield, and a heavy rainstorm of twenty minutes, at the rate of 1in. per hour, will result in a discharge from the airfield of some 6¼ million gallons.

These are some of the reasons why Heathrow appears to make only slow progress, and why work on all three initial runways cannot be finished before the middle of this year. Only the main runway has so far been completed, but, subject to reasonable weather and other circumstances, No. 3 Runway should be ready by the end of February and No. 2 Runway by mid-May. It will be no easy task to fulfil this programme, however, particularly in view of the urgent need to direct all building labour and materials to the relief of the housing difficulty

HEATHROW AIRPORT

The general triangulated layout of the airfield will be clear from the diagram—with one main E-W runway of 3,000 yards and two subsidiaries, NW-SE and NE-SW, of 2,000 yards each. All three runways are 100 yards wide and all have unobstructed approaches from either direction.

The main runway is said to be into the local prevailing wind and is connected by taxi-tracks from each end to the parking area near the control tower. Access to the southerly ends of the two subsidiary runways, however, appears to be a major problem at present, for aircraft landing to the south will have to return to the parking area either via the runway in use or else via the other two sides of the triangle.

The airfield site covers a very considerable area of land and has engulfed a number of public roads. It allows for runways to be extended and widened as required, an extension to 5,000 yards being possible in the case of the main runway. There is also room on the site for the construction of duplicate or even triplicate runways. Some such scheme is an obvious development, and a N-S runway may well become a necessity. Certainly, additional runways or taxi-tracks will be required in order to reduce taxying distances on an airfield of this size, and these are no doubt included in the final layout.

An unfortunate feature of the existing main runway is the diagonal east end. There are few pilots who, when making visual landing, do not "line up" their aircraft with the end of the runway in use, and this diagonal end needs squaring off in concrete as soon as possible.

Although the airfield is in the fog belt, the runways will not be provided with FIDO. Instead, full intensity airfield lighting will be installed, and for conditions of poor visibility, the latest radio navigational aids are to be made available.

The existing buildings are to Air Ministry wartime temporary standards, but it is understood that they are not likely to obstruct the eventual erection of the permanent airport buildings. The permanent buildings will doubtless absorb a large proportion of the estimated cost of the airport, but they must be regarded as a long-term project and there is little doubt that the present austere passenger handling facilities may continue to be in use for a long time. It is noteworthy that there is as yet no evidence of the provision of hangars or similar servicing facilities.

It is to be hoped that the permanent airfield buildings will not be stinted either in design or size in view of the vital importance of this air terminal, and of the impression, favourable or otherwise, which it is bound to make on visitors arriving by air in this country.

Whether or not visitors will gain a favourable impression also of the journey from Heathrow into London remains to be seen. Even at the moment the trip can be quite tedious by road and there is no adjacent railway station. This problem is being considered jointly by the Ministries of Civil Aviation and of War Transport, and there are hopes that there will be access to the airfield by rail, provided that either Paddington or Waterloo can cope with this extra traffic.

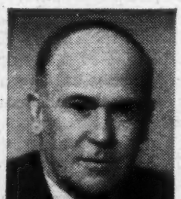
A really fast door-to-door railway service is vital to the success of this airport from the passenger's point of view.

Summing up, it may be said that the merest beginnings only have been made in the construction of a major airport, and Heathrow still has a long way to go before it can become an Empire Air Terminal.

"PLUM" WARNER RETIRES

CAPT. L. W. WARNER, A.F.R.Ae.S., Deputy Director-General of Aircraft Production, retired from the Civil Service at the end of the year. Affectionately known throughout the British aircraft industry as "Plum," Capt. Warner is one of the pioneers who has grown up with British aviation. He joined Short Brothers in 1909, where he worked with Horace Short on the very early types of aircraft, including the Short-Wright biplanes and the Short pushers flown by Col. (now Sir Francis) McClean, who, at his own expense, taught the first naval officers to fly.

"Plum" joined the A.I.D. in 1914 and was closely associated with the late Col. Outram for a number of years, advancing ultimately to be responsible for the inspection of complete aircraft. In 1938 he left the A.I.D. to become Assistant Director responsible for bomber production, and from 1939 until his retirement he was successively Deputy Director, Director, and finally Deputy Director-General of Aircraft Production at M.A.P.



Capt. L. W. Warner, whose retirement is announced.

His many friends in the aircraft world will join us in wishing "Plum" all happiness and contentment in his retirement.

NEW A.R.B. CHAIRMAN

LORD BRABAZON OF TARA takes over, on January 16th, the chairmanship of the Air Registration Board from Sir Maurice Denny, who has done extremely good work during his long term of office. Sir Maurice proved the ideal chairman in that not only did he grasp very quickly the essentials of any problem, but if a discussion tended to wander from the subject, as discussions have a way of doing, he tactfully set it on the right lines again. Lord Brabazon should prove a worthy successor, and one may recall that he has always stressed the importance of safety in the air, a subject in which the A.R.B. is very vitally concerned.

SOUTH AMERICAN SERVICE

ON the first day of the New Year and by way of signalising the fact that Heathrow had been handed over to the Ministry of Civil Aviation, a Lancastrian left on the first of a series of proving flights to Buenos Aires. It was being flown by Air Vice-Marshal D. C. T. Bennett, via Lisbon, Bathurst, Natal, Rio de Janeiro and Montevideo. Ten passengers were carried, including representatives of British South American Airways.

The Lancastrian reached Rio in an elapsed time of 32 hr. 20 min. after a flying time of 28 hr. 18 min. Montevideo was reached on January 4th after a 5 hr. 7 min. flight from Rio, and Buenos Aires on Sunday, January 6th.

When the regular British South American Airways service starts—at first on a weekly basis and later twice a week, leaving London on Mondays and Thursdays—the run will be broken with a night stop at Rio, and the company plans to extend the service to Santiago, Chile, as soon as possible. The total distance from London to Buenos Aires is about 7,200 statute miles, and the total time in the air will be approximately 33 hours.

The aircraft to be used are Lancasters which have been converted very thoroughly into Lancastrian form, though with a more comfortable and spacious layout for fourteen passengers. The Lancastrian has an economical cruise speed of 235 m.p.h.

The Rolls-Royce Griffon 130

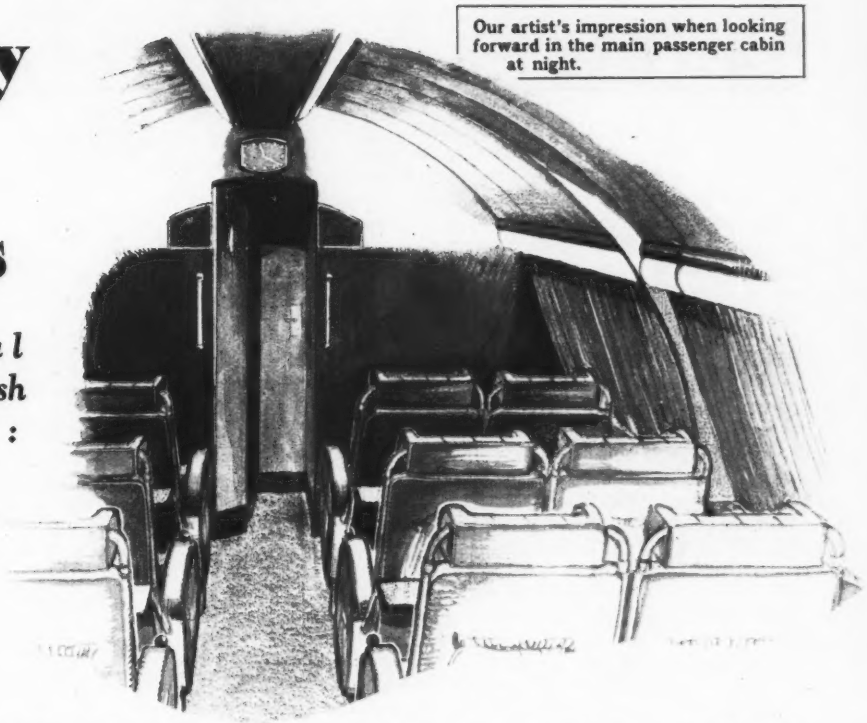
(*Concluded from page 36*)

supercharger air intake entirely unrestricted. This small, amazingly efficient unit is driven directly from the engine, and serves the dual purpose of pumping its own fuel and supplying it in the correct ratio direct to the supercharger through a discharge nozzle at the top of the air intake.

There is thus only one unit for both the supply and metering of the fuel as opposed to the usual fuel pump and carburettor. The pump is extremely light, weighing only 10 lb., and it requires no complicated adjustment in service, as it is possible to calibrate it for maximum efficiency on a test rig before fitting to the engine: in service the only adjustment necessary is for slow running, and this can be done without upsetting the metering range. It is not permissible at this stage to elaborate on the internal details of the pump unit, but it may be said that it is probably the most efficient system of fuel injection so far applied to piston engines in that it provides perfect fuel metering over the whole range of engine speeds.

Handley Page Hermes

A Very Useful Addition to the British Aviation Family: Clean Aerodynamic Design and Luxurious Passenger Accommodation

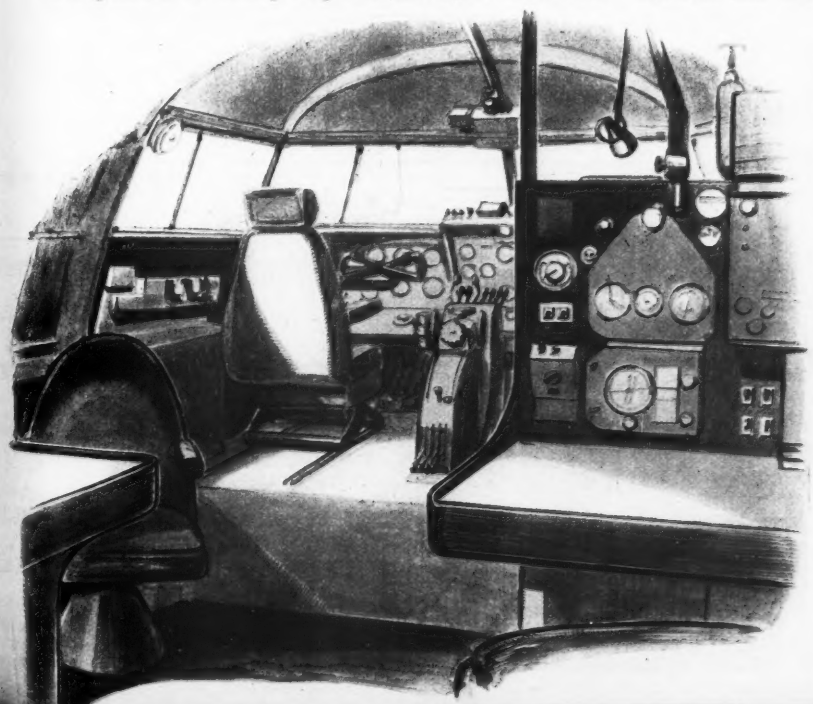


Our artist's impression when looking forward in the main passenger cabin at night.

SINCE the first notice of the Handley Page Hermes appeared in *Flight* of October 12th, 1944, a good deal of progress has been made towards getting the aircraft into use, and development work is proceeding apace in spite of the unfortunate accident to the prototype. It is certainly a machine which is likely to have a large future, since it is capable of fulfilling a variety of duties, ranging from freight carrier to luxury passenger air liner. Although the same basic aircraft will be available for whatever a potential operator's requirements may be—in this size field—for the purpose of this review it is in its passenger-carrying guise that we shall consider the Hermes, and from this aspect there are excellent grounds for anticipating that passengers who travel by this aircraft will be very well satisfied with their means of transport.

If we enter the aircraft as would the passenger, through the main entry door at the after end of the cabin on the port side, we first find ourselves in a vestibule finished in Indian laurel, a beautiful wood which imparts an air of quiet richness and good purpose. At the after end of the vestibule is the steward's pantry, which is laid out with an order of planning that our modern kitchen designers might do well to emulate. On the forward wall is mounted the water filter, electric water heater, main cabin lighting control panel and, beneath it, the steward's call indicator board. Beneath these is a stainless-steel sink with integral draining board, and by the starboard wall is an electric hotplate with grill beneath. The rear wall is completely filled with hot-chest compartments, a refrigerator, and commodious cupboards and drawers for cutlery, china and tableware. On the port side of the pantry door is a very nicely designed miniature bar, with bottle racks and drawers for glasses fitted beneath the counter, which is opened to the vestibule by a hatch.

On the starboard side of the vestibule are the ladies' boudoir (forward) and ladies' toilet room (aft), centrally dividing the doors of which is a miniature library whence passengers can borrow books. The toilet room is fitted with the latest type of Elsan flushing w.c., and the boudoir, which is similarly fitted in sycamore impregnated ply, is furnished with a lustrous-finish plastic



The flight deck, from the engineer's position, showing (left) radio officer's seat, (centre) captain's seat and (right) navigator's station.

HANDLEY PAGE HERMES CIVIL A

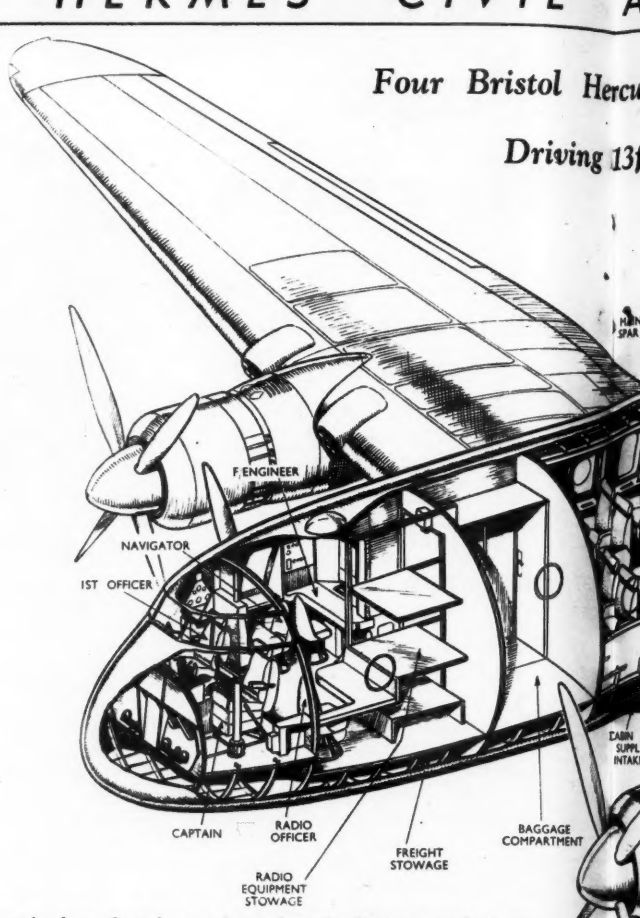
single-piece dressing table and wash-basin, above which is a large mirror surmounted by an opalescent lamp. At the rear of this mirror is a transparent plastic water tank which feeds the basin, and a narrow hinged panel at the side of the mirror enables one to see at a glance the quantity of water in the tank. The electric water heater is contained in a cupboard beneath the basin, and a drawer under the dressing table is for clean towels; soiled towels are intended to be placed in a cupboard beneath the water heater, though (to be ultra-critical) we can scarcely imagine a lady passenger getting on her hands and knees in order to read the label "Used Towels" on the door of this cupboard.

On entering the main cabin, immediately to port of the doorway is a curtained compartment for coats, with a shelf for hats above. The mocquette-upholstered seats are arranged in pairs throughout the length of the cabin on each side of a generously wide central aisle, with 18 seats to starboard and 16 seats to port. All chairs are adjustable through about 15 deg. for rake of backrest, and each is fitted with a winged head-rest adjustable for height, and incorporating an individual reading light in one wing. In the fully-forward position the seat backs are, perhaps, too nearly upright to be really comfortable, and it would seem to be more useful to give them a static rake of, say, 10 deg. from the vertical, and a full rake of 25 deg.

Interior Decoration

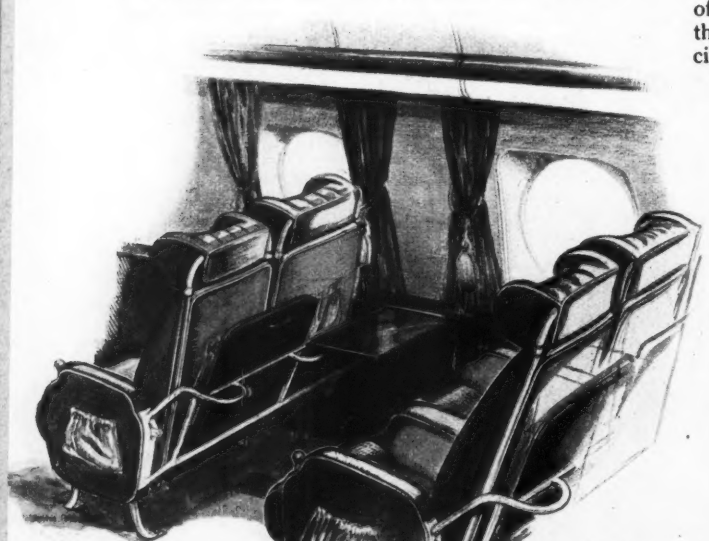
The "man in the armchair" device engraved on the sensibly commodious pull-out ash trays in the central arm-rests dividing each pair of seats establishes the fact that the interior decorations and planning for the Hermes is the work of Rumbolds; and very nice work it is, too. Ingenious folding tables are carried on a tubular framework off the rear of each pair of seats, and when not in use, fold away parallel to the seat back. When required, each table can be slid up and then hinged downward to form a handy flap supported by brackets on the frame. Further, at each seat station is a steward call button which, when pressed, illuminates so that the steward can see at once where his services are required, and each seat is equipped with two pockets for magazines, handbags, etc., the outboard seats having cubby recesses in the dado shelf which runs beneath the windows. The latter are generous in area and circular in shape, although at three seat stations on each side of the cabin the windows are arranged as escape hatches, their shape in these cases being straight-sided with semi-circular tops.

As shown in the accompanying illustrations, the colour

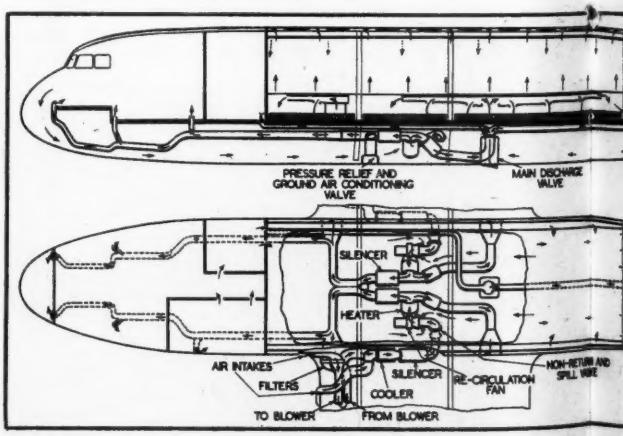


Four Bristol Hercu

Driving 13



The very comfortable adjustable seats each have a convenient folding table and headrests incorporating individual reading lights.



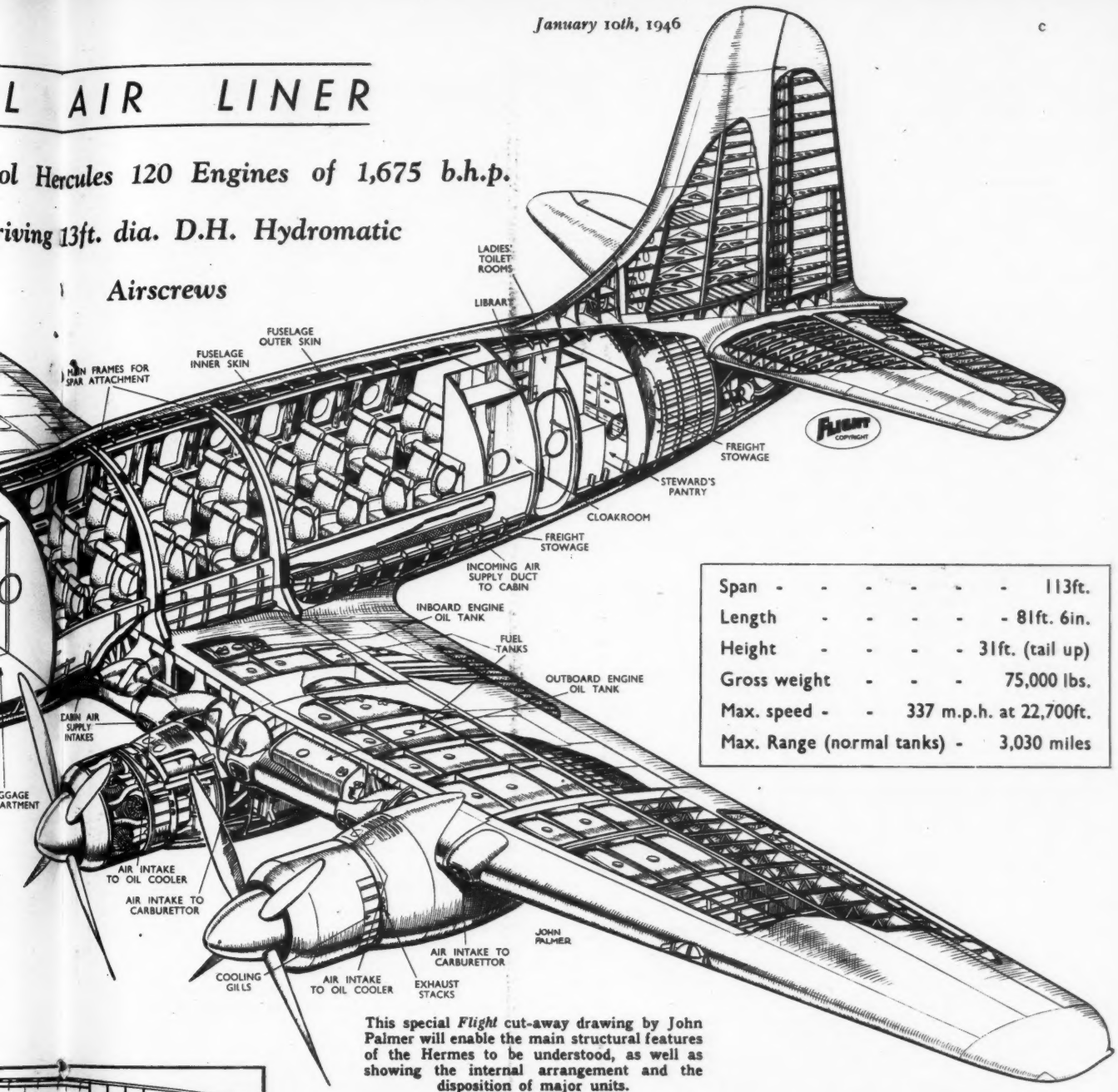
These two diagrammatic drawings serve to illustrat the cabin atmosphere conditioning equipment, h floor and in the wing centre-section, and also sho air through the various compartments of t

L AIR LINER

ol Hercules 120 Engines of 1,675 b.h.p.

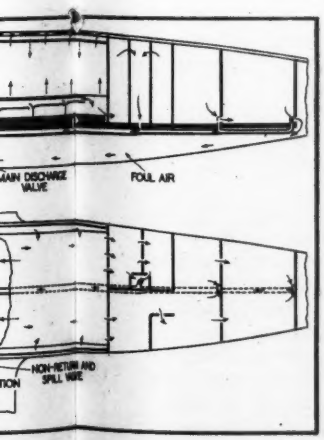
riving 13ft. dia. D.H. Hydromatic

Airscrews

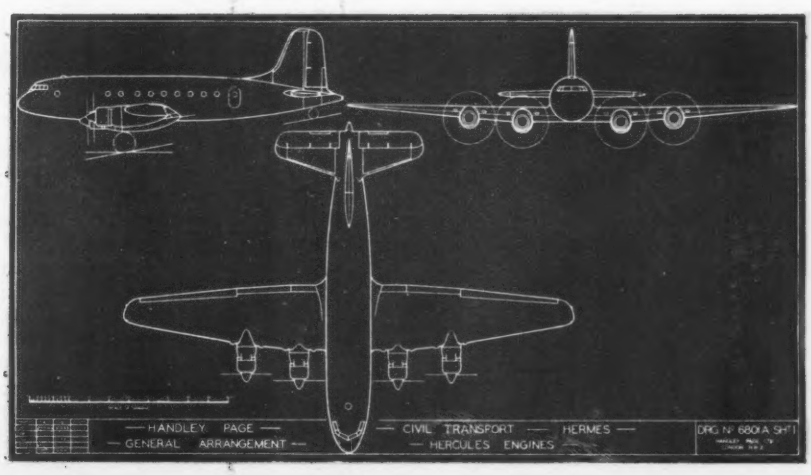


Span	113ft.
Length	81ft. 6in.
Height	31ft. (tail up)
Gross weight	75,000 lbs.
Max. speed	337 m.p.h. at 22,700ft.
Max. Range (normal tanks)	3,030 miles

This special *Flight* cut-away drawing by John Palmer will enable the main structural features of the Hermes to be understood, as well as showing the internal arrangement and the disposition of major units.

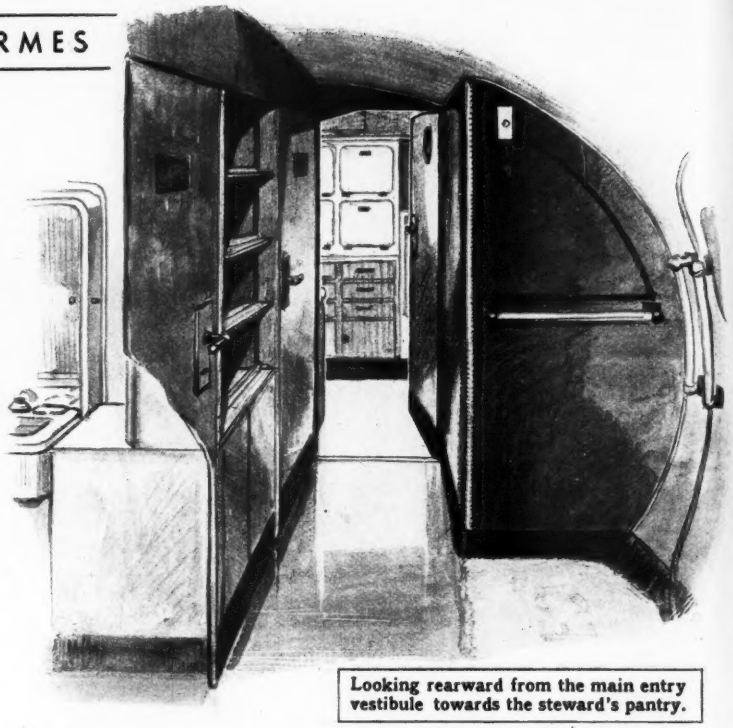


s serve to illustrate the disposition of ng equipment, housed beneath the ion, and also show the flow paths of ompartments of the fuselage.



HANDLEY PAGE HERMES

scheme of the cabin is blue for the seats and carpet, with russet curtains to the windows, these colours being admirably offset by the rich brown of the wood trimming forming the dado and end panelling, and the whole pleasingly contrasted to the walls and roof finished in stone-coloured Vynide cloth. Illumination of the main cabin is specifically designed to be at the same time efficient and restful. It consists of lighting strips above the windows and on each flank of the central air duct in the roof. The strips themselves are of a translucent frosted plastic, and conceal tubular lamps which are controlled from the light panel in the steward's pantry. Half the lamps in each strip can be switched off so as to reduce the light intensity for night travel, and it is here that the individual reading lights in the chair head-rests come into their own, should one passenger want to read whilst his neighbour wishes to sleep.



Looking rearward from the main entry vestibule towards the steward's pantry.

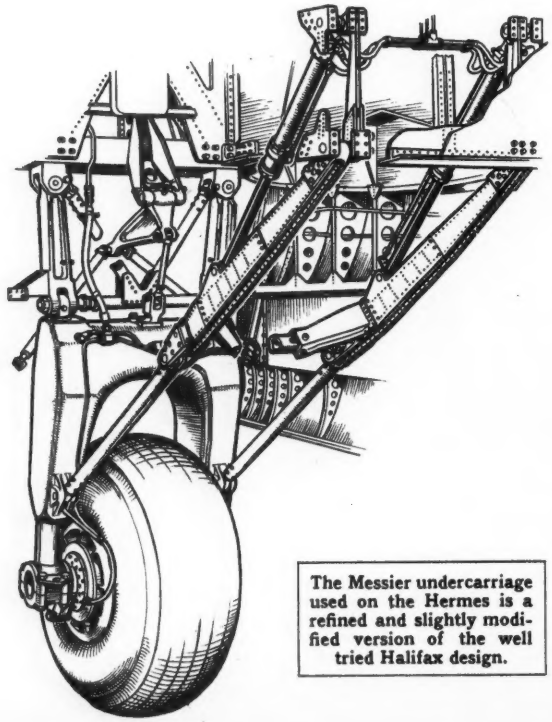
Use of Plastic

It is noteworthy that the trim furniture throughout the aircraft is carried out in a plastic material with a pearl lustre finish, the roof air-duct, cornice light strip, finishing beads to windows, handrails and door furniture, etc., all being of this material, as are the furnishings in the toilet rooms.

The main fuselage frames, to which the wing spars are attached, break the normal interior cabin surface line and, by so doing, quite incidentally seem to provide an unobtrusive discontinuity in what might otherwise be too plain a roof treatment. From a purely decorative aspect one is constrained to feel that the preponderance of decorative weight and colour is kept at a low level in contrast to a very plain and unrelieved upper surface; this might possibly be ameliorated by a tone-shading treatment of the ceiling from the windows towards the centre of the roof.

The forward door of the main cabin opens into a vestibule, to port of which is a wardrobe with sliding doors, and to starboard the men's toilet. This is equipped with the same type dressing-table and wash-basin as that of the ladies' boudoir, and also incorporates an Elsan flushing w.c.

Forward of the vestibule, entry is gained through a central door to the control cabin. The rear portion of the flight deck is taken up to port with, alternatively, a baggage stowage compartment or, if baggage stowage is not required, a crew rest-room. To starboard of this are stowages for the astro-compass and access to the electrical bus-bar and electrical auto-control generator panel; forward of these is the engineer's personal locker with, beneath it, access to the rear of his instrument panel. The engineer's panel is comprehensively equipped in the orthodox manner with engine and fuel controls in the centre and electrical controls above, and engine and fuel instruments carried in flanking panels on each side—the engineer sitting facing aft. On the starboard wall (that is, on the engineer's left) is the control panel for cabin atmosphere control.



The Messier undercarriage used on the Hermes is a refined and slightly modified version of the well tried Halifax design.

Flight Deck Layout

Forward of the engineer and back-to-back with him sits the navigator, who is provided with all the conventional modern radio, radar and mechanical devices. The radio compass is fitted above his right shoulder with the drift meter beneath it, and on his front panel are mounted the D.R. compass control, altimeter, air-pressure gauge and A.S.I. with, on the right of these, the radar sets. Opposite the navigator on the port side of the flight deck sits the radio officer, facing aft immediately behind the captain. His equipment is very neatly laid out with excellent servicing access from side panels and from the baggage-compartment crew rest-room. Beneath the radio side access panel is a folding flap which, when lifted up, forms a step for the navigator

to stand on when using the astrodome in the roof.

The control part of the flight deck is nicely designed and is admirably conducive to ease of working. As with so many features of aeronautical practice, designs based upon functional precepts and untrammelled by "artistry" have a distinct appeal all of their own. Both the captain and first officer have individual blind-flying panels separating the engine, r.p.m. and boost indicators which are mounted in a central panel together with radio compass dials (one for each pilot), the D.R. compass repeater and, beneath, landing lights control switch, flap indicator, undercarriage indicator horn and warning light. Above this central panel are various light switches, the auto-pilot control, and the engine fire extinguisher and airscrew feathering buttons.

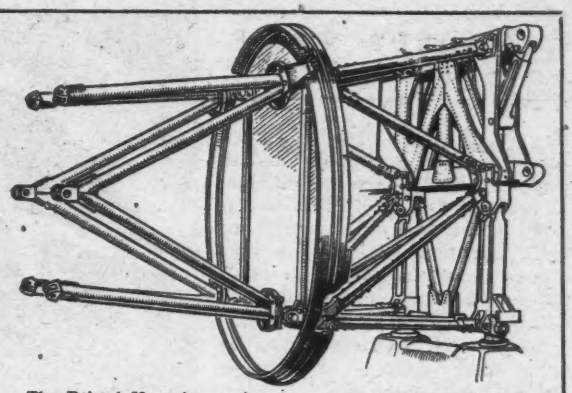
Flying Controls

Pilots' seats are very comfortable and are adjustable fore and aft, up and down, and for rake of back; they also have folding armrests and headrests adjustable for height. Rudder pedals are S.B.A.C. standard toggle-action adjustable units, and the control columns are mounted outboard of each seat with a cantilever arm carrying the Halifax-type spectacles for aileron control.

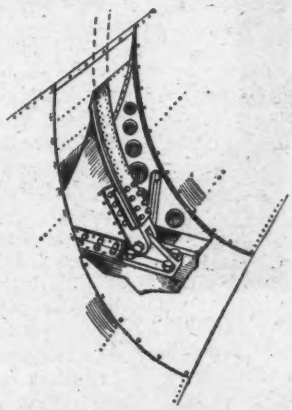
Centrally between the seats is a well-designed control pedestal on which are carried the throttles and engine-speed controls with, rearward of them, the trim controls mounted in a single unit and arranged to operate in the natural sense. Beneath and rearward of the trim box are controls for undercarriage, flaps, tailwheel lock, automatic pilot and carburettor ram or clean air.

From the point of view of visibility, Hermes pilots are well off, for the screens are not too curved, neither have they too much rake. Furthermore, they are arranged as close as may be to the pilots' eyes. As in other modern civil aircraft, the rather unfortunate blanking-off of almost the whole of the top hemisphere of view occurs in the Hermes; but visibility immediately forward and downward is unusually good.

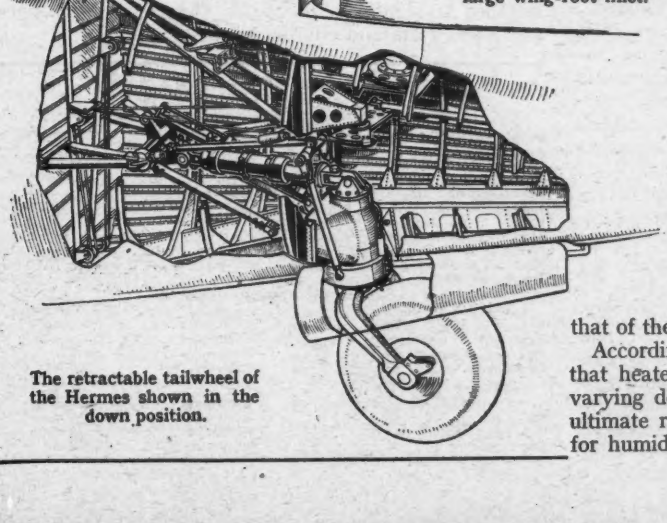
Before going on to survey the structural features of the aircraft, we may with advantage consider the cabin atmosphere conditioning system. The Hermes is designed for a normal operating altitude of 25,000ft., with a differential cabin pressure of 5½ lb/sq. in., so that, when flying at this altitude, the equivalent altitude will be 8,000ft.



The Bristol Hercules engines are supported from the wing front spar by a triangulated system of tubes. The undercarriage is attached to the spar behind the inboard engines.



Attachment of wing rear spar to fuselage. The circular section of the fuselage necessitates a large wing-root fillet.



The retractable tailwheel of the Hermes shown in the down position.

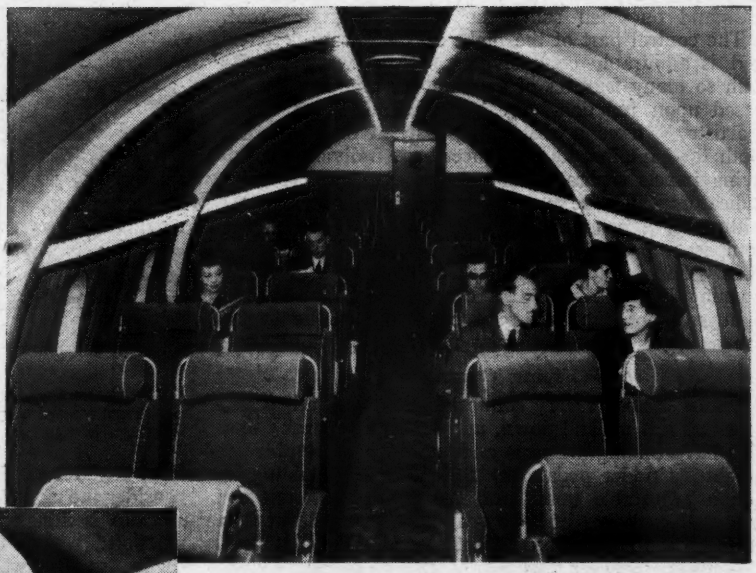
Air is entrained through ram heads in the wing-root leading edge, whence part is ducted direct into the system and the rest fed to the Roots-type Marshall blowers driven one by each inboard engine. From each blower the air is passed through an air-to-air cooler and thence through a silencer; on leaving the silencer the air is fed to a spill-and-non-return valve fitted in the fuselage wall, whence it flows to a recirculating fan and so to a surface-combustion-type heater. The air is ducted from the heater fore and aft through further silencers, and is then led to the walls of the cabin and also to the flight deck; distribution to the cabin is through static pressure ducts with outlets through low-velocity 50/50-mesh grilles on each side at skirting level. From the cabin, airflow is outward into the forward toilet, the ladies' boudoir and toilet room aft, and also to the steward's pantry and the aft luggage compartment, thus no fouling of the air from these compartments can contaminate the cabin atmosphere. Vitiated air from the toilet rooms, galley, etc., is ducted to a discharge vent to atmosphere, and the remaining proportion of the cabin air is exhaled into the central roof duct and so led down between the inner and outer fuselage skins to the under-floor space, where it is entrained by the recirculating fans and again used. The disposition of the various units of the conditioning system is shown by the diagrammatic drawings on pp. *a* and *b*, which also serve to show that the system as just described is duplicated port and starboard in every particular save that of the main discharge-valve.

According to climatic conditions obtaining, it is likely that heaters and/or coolers may be dispensed with in varying degree, but this will satisfy only a part of the ultimate requirement, for no provision is as yet made for humidifying or drying equipment; thus, should the

HANDLEY PAGE HERMES

Hermes be called upon to fly in Arctic weather or tropical summer climates without these conditioning refinements, it is likely that passengers might experience some discomfort. For temperate climatic conditions, however, the cabin atmosphere control system should be all that could be desired.

Structurally, the Hermes is orthodox, and conforms to accepted modern practice in having a fuselage of circular cross-section throughout, this form providing the additional advantage of the most simple stressing cases for pressurising. Skin



Above: Looking aft down the Hermes' beautifully appointed cabin. Below, left: The kitchen is equipped with every possible modern service.

plating is riveted to top-hat-section stringers on Z-section frames, the latter being extended progressively in depth by additional web plates down from about 18in. above floor level, and stabilised fore and aft by light channel-section intercostals. At wing-spar stations the frames are fairly massive I-section structures made up of extruded T-section booms and plate webs, the spar attachment being by means of forged brackets, as shown in a detail sketch on page 39. The fuselage floor is of plywood supported on I-beams which span the lower arc of the fuselage at each frame station, and are stabilised fore and aft with light channel-section intercostals. A tubular triangulated bracing also extends down on each side from the floor beams to the frames at the base of their curvature.

The Hermes wing is basically similar to that of the Halifax only in that proven structural practices are followed—it is not a Halifax wing, but merely has a family likeness. Two-spar structure is used throughout, the centre section main spar being comprised of single-length deep-channel-section extruded booms with built-up box-member, Warren-girder-type bracing, whilst the rear spar is of I-section with extruded T-booms to a plate web; spar joints are formed with super HT steel single pins in HT end fittings bolted to booms. Chordal inter-spar ribs are all diaphragm type with angle extrusions on each side, top and bottom, and in way of the fuselage the skin is continuous between the spars, in the form of a cradle, to maintain continuity, and function additionally as a lateral inter-spar diaphragm. The centre-section leading edge is skinned on open diaphragm nose ribs, and is removable for access to the plumbing, electrics and engine controls carried on the forward face of the front spar. Trailing-edge ribs are open-diaphragm type extending to the curved shrouding of the Handley Page slotted-type flaps; these are fitted in two sections, port and starboard, one to the centre section and the other on the intermediate wing.

Engine-mounting arrangements are unlike those of the Halifax in that, whilst the inner engines are carried on the outboard ends of the centre section, the outer engines are on the outboard end of the intermediate wing panels, whereas on the Halifax the outer engines were mounted on the inboard ends of the outer wing panels.

Tankage is mainly housed in the intermediate wings, and comprises four tanks fitted chordwise between spars with Warren-girder-braced inter-spar ribs between each tank. Two further tanks are housed between the spars at the inboard end of each outer plane, and all tanks are installed from above, the hatch covers being attached along the spars and chordal ribs.

HANDLEY PAGE HERMES
FOUR BRISTOL HERCULES 120
DIMENSIONS AND PERFORMANCE

Wing area	1,408 sq. ft.
Aspect ratio	9.08
Wing loading	53.25 lb./sq. ft.
Power loading	11.2 lb./b.h.p.
Minimum profile drag	418 lb.
Fuel capacity (normal)	2,574 gall.
Max. W.M. cruising speed	284 m.p.h. at 22,700 ft.
Economical cruising speed	254 m.p.h. at 25,000 ft.
Max. rate of climb—sea level	1,010 ft./min. (at 75,000 lb.)
Max. rate of climb—20,000 ft.	500 ft./min. (at 75,000 lb.)
Time to 20,000 ft.	24.3 min. (at 75,000 lb.)

RANGES AND PAYLOADS

	At Max. W.M. Power	At Economical Speed
At 10,000 ft. (M gear)		
Range with 15,950 lb. load	1,410 miles	1,740 miles
Range with 12,000 lb. load	1,910 miles	2,450 miles
Max. range (normal tanks)	2,340 miles	3,030 miles
Corresponding load	8,800 lb.	8,800 lb.
At 25,000 ft. (S gear)		
Range with 15,950 lb. load	1,460 miles	1,500 miles
Range with 12,000 lb. load	2,050 miles	2,150 miles
Max. range (normal tanks)	2,540 miles	2,690 miles
Corresponding load	8,760 lb.	8,760 lb.

THE JET-ENGINE FUEL SYSTEM

Supply, Atomising and Control Equipment

Developed by Joseph Lucas

IT would not be inapt to describe the fuel and combustion systems as the "heart and soul" of the aircraft turbine power unit, whether for jet or airscrew propulsion. This article on the fuel system, in conjunction with the one on combustion research in the previous issue, gives the first full account of the development and functioning of these vital components. It is a record of persistent, painstaking effort by Joseph Lucas, Ltd., undertaken in collaboration with Rolls-Royce, Ltd., which in its successful achievement has made a substantial and noteworthy contribution to British prestige in the air.

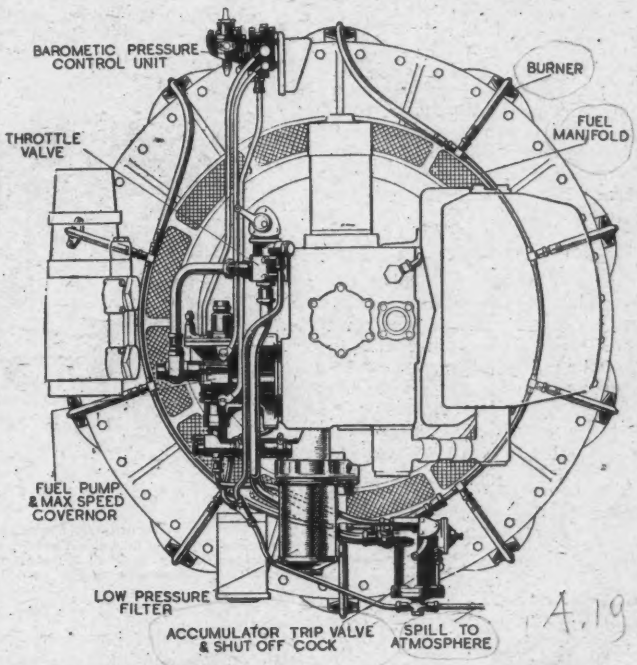
WHILST the work of evolving the jet-engine combustion system and equipment was proceeding,* a parallel activity of Joseph Lucas, Ltd., was the development of fuel pumps, burners and regulating components for the control of the engine. Initiated in Birmingham, this work was for a short time transferred to Acton, but subsequently returned to a specially equipped factory at Birmingham.

Early Whittle engines employed a constant-displacement pump and a barometrically-controlled variable by-pass, but it was decided at the outset that such a system suffered from certain limitations and did not offer adequate scope for future development. To meet the wide ranges of fuel flow required by the gas turbine at varying air speeds and altitudes a pump having a variable stroke, regulated by a servo system under barometric control, was deemed more desirable. As no pump of light weight and occupying small space was available to meet these requirements, the development of a special pump was undertaken. After surmounting early difficulties of considerable magnitude, a successful design was evolved for the pump which has been employed on all Rolls-Royce jet engines.

Clean fuel is essential for satisfactory operation owing to the fine working clearances of the components and the relatively restricted passages in the burners. Accordingly, all Bowser tankers employed for refuelling jet aircraft are equipped with Streamline filters to prevent the transfer of foreign matter to the aircraft tank. Fuel is drawn from the tank by a submerged electrically-driven, centrifugal-type Pulsometer pump and is passed through a Tecalemit fabric-type filter before reaching the pressure pump.

On the power unit the fuel system includes the following components—variable-stroke pump with a built-in maximum speed governor and an automatic pressure-relief mechanism, barometric control unit, throttle valve, a unit embodying accumulator, trip valve and high-pressure cock, fuel manifold and burners. Disposition of this equipment on the wheel case at the forward end of the Rolls-Royce Derwent engine is shown in an illustration, and connections can be readily followed in the diagrammatic layout.

Fuel is fed to the engine-driven pump, which operates in conjunction with the altitude-conscious barometric control unit and is subject to the over-riding control of the hydraulic-type governor, which prevents the engine speed exceeding a predetermined maximum. From the pump the fuel is delivered to the throttle valve, which is regulated by the pilot from the cockpit, and thence to the accumulator unit, the ring manifold and, by individual flexible pipes, to the burners in the combustion chambers. The accumulator is required to build up a volume of fuel under adequate pressure for starting purposes. When shutting down the engine the high-pressure cock shuts off the flow of fuel to the burners. Drain connections from pump, throttle and accumulator unit discharge to atmosphere. Gauges are provided to indicate pressure at the pump delivery and in the manifold and depression at the pump intake. In conjunction with the last, a pressure-sensitive switch operates a warning light in the event of the fuel supply being interrupted by a clogged low-pressure filter.



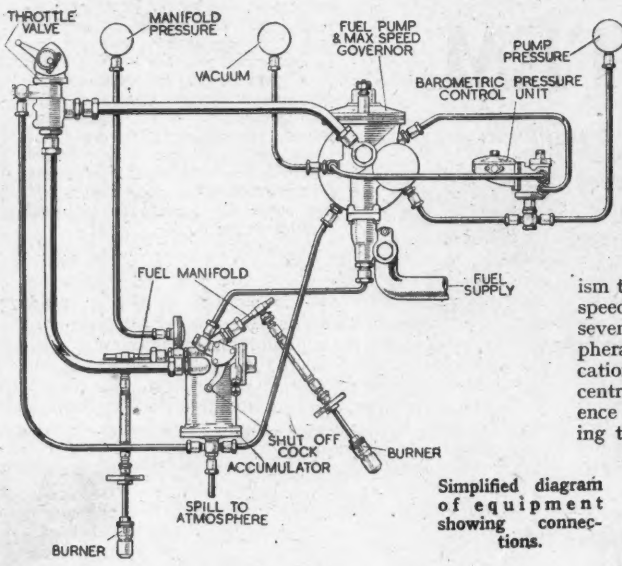
Installation of fuel equipment on Rolls-Royce Derwent jet engine.

The seven plungers of this positive-displacement pump reciprocate in a rotor running in a carbon bush and a roller race and driven from the engine by a splined quill shaft. The bores for the plungers are spaced evenly around a pitch cone concentric with the rotor axis and converge towards the inner or pumping end. Reciprocation of the plungers is effected by means of a cam plate engaging the outer ends of the plungers. The cam plate is carried on a large-diameter ball bearing mounted in a control ring swivelling on a pair of trunnion pins set at right angles to the rotor axis. By varying the angle of the plane of the cam plate relative to the rotor axis from 90 deg. to 81 deg. the stroke of the plungers is varied from zero to approximately 10.5 mm. Retraction of the plungers on the inlet stroke is ensured by helical springs located against the reduced inner ends of the bores.

At its inner end the face of the rotor is ground flat and smooth to make a pressure-tight seal with a valve insert furnished with two kidney-shaped ports communicating respectively with the pump inlet and the pump delivery. Thus each plunger bore is in communication with the suction and delivery passages of the pump once in each

* Described in *Flight*, 3rd January, 1946.

THE JET-ENGINE FUEL SYSTEM



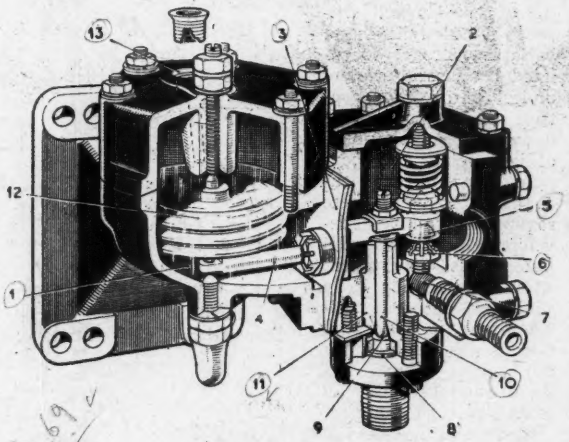
Simplified diagram of equipment showing connections.

revolution. On reaching the pump inlet, fuel under pressure from the supply pump in the tank passes through a gauze strainer and, by way of the suction port in the valve insert, charges the bore as the plunger moves outwardly. Continued rotation reverses the motion of the plunger, causing the fuel to be discharged at high pressure through the delivery port of the valve insert.

Pressure Control System

Parallel with the rotor axis is a bore in which the pressure-control piston operates. The piston rod is connected by a link to a lug on the control ring, and concentric helical springs bias the piston to move the control ring to the position for maximum stroke of the pump and consequently maximum output. From the delivery side of the pump, fuel under pressure is applied below the piston in opposition to the springs and also, by way of an adjustable restricting orifice, above the piston. From this space above the piston fuel can escape by way of a plate valve which is normally held to its seating by a spring-loaded rocker. By this means the fluid forces acting on the piston are balanced, and there is no resulting movement. Should, however, the fluid pressure exceed a value determined by the spring loading of the rocker, the plate valve will be lifted from its seating and the flow through causes a pressure drop to occur across the restricting orifice and creates a state of unbalance between the pressures acting on opposite faces of the piston. Under this influence the piston moves to a new position, reducing the stroke of the plungers and consequently the output of the pump. The system is thus safeguarded against the possibly harmful effects of excessive pressure.

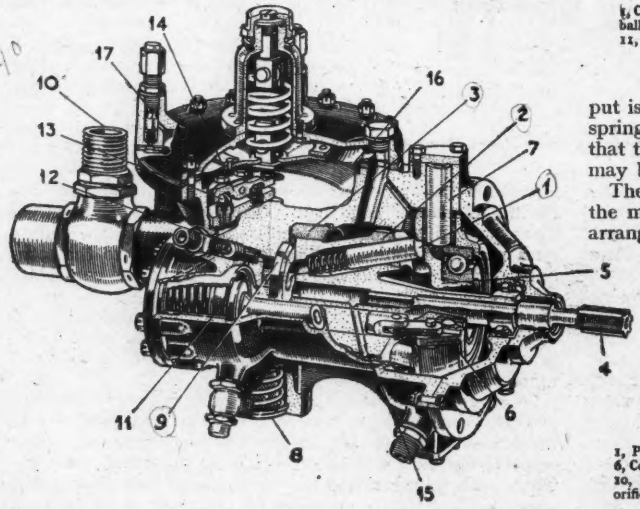
Incorporated in the pump is a hydraulic mechanism to limit the pump output, and consequently the engine speed, to a predetermined maximum. In the rotor are seven radial drillings extending from the maximum peripheral diameter to an axial bore which is in free communication with the suction chamber of the pump. In operation, centrifugal force produces in the drillings a pressure difference which results in the fuel in the pump casing surrounding the rotor and also in the space above the diaphragm being maintained at a pressure higher than obtains in the suction chamber. This pressure difference is utilised to move the diaphragm, against the constraint of a helical spring in tension, so that it depresses the rocker and unloads the plate valve. The pump output is then reduced in the manner already described. The spring loading of the diaphragm is readily adjustable so that the engine speed at which the governing action begins may be set with accuracy.



Barometric Pressure Control Unit.

1, Capsule chamber; 2, Valve chamber; 3, Pivot plate; 4, Rocker; 5, Half-ball; 6, Orifice; 7, Filter; 8, Diaphragm; 9, Piston; 10, Operating rod; 11, Eccentric adjusting sleeve; 12, Barometric capsule; 13, Vent to atmosphere.

The loading of the springs on the control piston opposing the movement of the cam plate to the zero position is so arranged that the minimum pressure at the burners when the governor is in operation is more than adequate to maintain atomisation of the fuel. The possible extinction of the flame due to governor action is thereby prevented. Should the rotational speed of the engine be lowered by "throttling back" and reducing the fuel supply to the burners, the pressure acting on the diaphragm is reduced until



Fuel Pump.

1, Plunger; 2, Rotor; 3, Carbon bush; 4, Quill shaft; 5, Cam plate; 6, Control ring; 7, Trunnion pin; 8, Inlet strainer; 9, Ported valve insert; 10, Delivery connection; 11, Pressure control piston; 12, Restricting orifice; 13, Plate valve; 14, Rocker; 15, Radial holes in rotor; 16, Diaphragm; 17, Bleed valve.

FRESH AIR IN THE AIR

The trouble about air travel is too often in the air—passengers are apt to be continually reminded of the presence of galley and toilet, to say nothing of the possibility of odours of hot oil and fumes from the engines. The problem of combating unwanted odours in confined spaces has been solved scientifically by the Ozono system. Air is completely deodorised and revitalised by the presence of an Ozono generator near the source of the trouble, and the most fastidious passenger can face a long journey without uneasiness or distaste.

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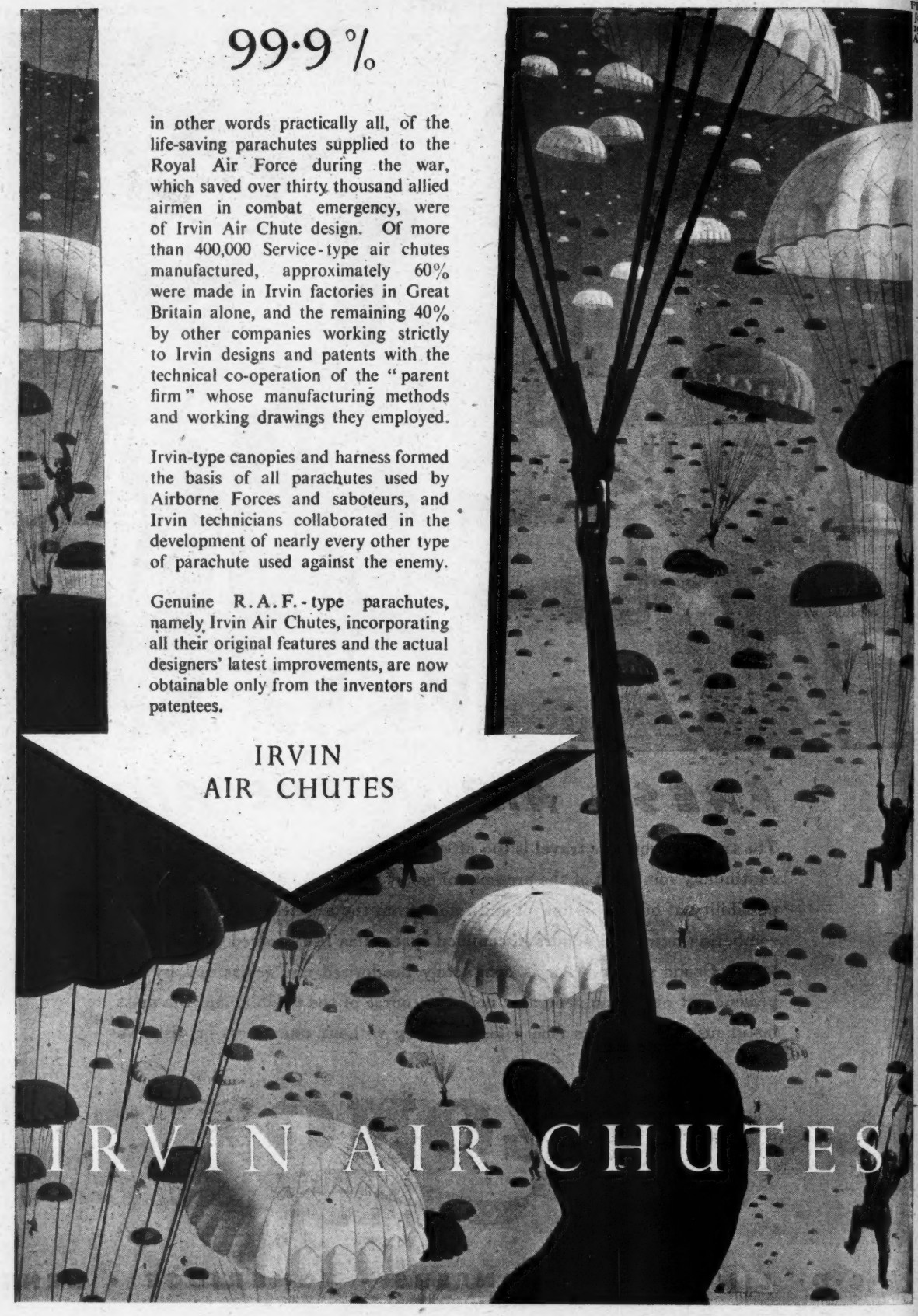
in other words practically all, of the life-saving parachutes supplied to the Royal Air Force during the war, which saved over thirty thousand allied airmen in combat emergency, were of Irvin Air Chute design. Of more than 400,000 Service-type air chutes manufactured, approximately 60% were made in Irvin factories in Great Britain alone, and the remaining 40% by other companies working strictly to Irvin designs and patents with the technical co-operation of the "parent firm" whose manufacturing methods and working drawings they employed.

Irvin-type canopies and harness formed the basis of all parachutes used by Airborne Forces and saboteurs, and Irvin technicians collaborated in the development of nearly every other type of parachute used against the enemy.

Genuine R.A.F.-type parachutes, namely Irvin Air Chutes, incorporating all their original features and the actual designers' latest improvements, are now obtainable only from the inventors and patentees.

IRVIN
AIR CHUTES



THE JET-ENGINE FUEL SYSTEM

contact between it and the rocker is broken and the plate valve is re-seated; pressure above the control piston is restored and the cam plate is moved to increase the stroke. It is essential for correct functioning of the pump that no air is allowed to accumulate on either side of the diaphragm. A ball-type bleed valve is provided to evacuate air from both upper and lower spaces, and after use is sealed off by a blank nipple to prevent leakage.

In contradistinction to a barostat, which regulates the delivery of a constant-output pump by spilling excess fuel at altitude back to the tank, the barometric pressure control unit varies the delivery pressure of the pump in accordance with change of altitude. As the pressure-control piston of the pump is connected to the cam plate, the stroke is varied and the delivery flow of fuel adjusted to specific requirements.

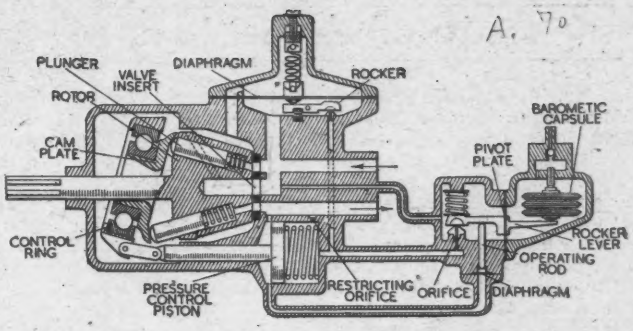


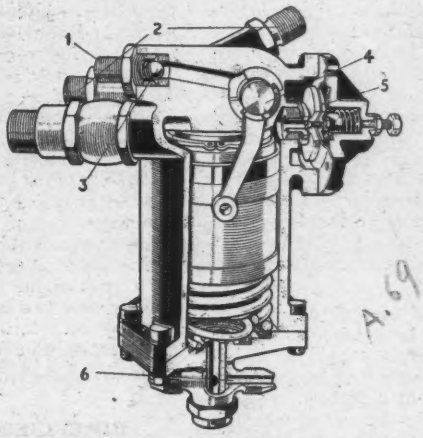
Diagram of pump and barometric pressure control unit showing inter-connections.

Barometric Control Unit

Constructionally, the unit comprises a body divided into a capsule chamber and a valve chamber by a diaphragm which isolates the two chambers and serves as a pivot plate to which is secured a rocker lever extending into both. The barometric capsule is mounted with its lower pivot seated in one end of the rocker lever and its upper pivot located in an adjustable screw mounted in the chamber cover. A stop screw in the base of the chamber limits movement of the rocker lever.

The other end of the rocker lever is loaded by a spring and carries a half-ball seating on an orifice supplied with fuel at servo pressure from above the pressure-control piston of the pump. Control of the rocker lever is by fuel at delivery pressure from below the pressure-control piston. Pressure is applied to a rubber diaphragm and transmitted by a small piston and an operating rod, the upper end of which abuts the end of an adjuster screw in the rocker arm. These components are mounted in the base of the chamber in an eccentric sleeve to enable the end of the rod to be moved across the face of the adjuster screw to alter the operative distance from the fulcrum point of the lever. The valve chamber is in open communication with the inlet side of the pump. Connections are made clear in the diagram of the pump and barometric control unit.

Should the force applied by the pump delivery pressure exceed the spring loading the rocker lever will pivot, lift the half-ball from the orifice and allow servo pressure fuel to spill into the valve chamber. This unbalances the pressure-control piston, which moves to reduce the stroke of the pump. Consequently the pump output decreases, and the delivery pressure is lowered until it just suffices to balance the spring load. Balance is maintained by a small spill past the half-ball. A fall in pump delivery pressure allows the spring to seat the half-ball, closing the orifice and, in turn, increasing the pump stroke.



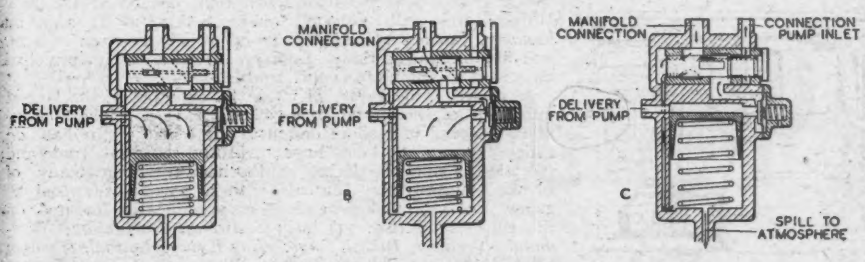
Accumulator, trip valve and high-pressure cock.
1, Connection to pump inlet; 2, Connections to manifold; 3, Relief valve; 4, High-pressure cock; 5, Trip valve; 6, Spill to atmosphere.

The barometric capsule exerts a force which assists the pump delivery pressure to oppose the spring load. At ground level the force is determined by adjustment of the upper pivot screw which compresses the capsule. As altitude is increased and barometric pressure falls, the capsule tends to lengthen, and the pressure exerted on the rocker lever becomes greater. The spring load remains constant, and consequently the pump delivery pressure reduces until a balance is reached. The reverse action takes place as altitude is reduced and barometric pressure rises.

Throttle Valve

Located between the pump and the accumulator unit, the pilot's throttle valve, is a tapered plunger valve in which the cross-sectional area of the flow space between plunger and seating is varied by axial movement of the plunger. Operation is positive, as a pinion on the actuation lever spindle engages a rack cut on the plunger. When the throttle is closed the plunger is fully seated but the engine is not shut down. A supply of fuel to maintain the engine running in the idling condition is by-passed from the inlet to the outlet by way of a spring-loaded valve opening automatically under fuel pressure. An adjustment screw limits the lift of this valve to determine the flow for slow running.

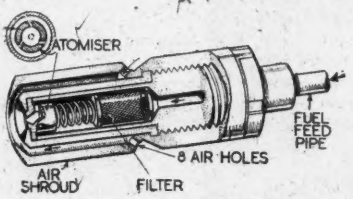
To shut down the engine a high-pressure cock is provided to stop the fuel flow to the burners. This is embodied in the accumulator unit. At starting and whilst running the cock remains in the fully opened position. When starting-up the engine, the cranking speed is insufficient to produce a delivery of fuel yielding a



Flow diagrams of accumulator, trip valve and high-pressure cock.
A. Cock open. Trip valve closed. Accumulator charging.
B. Cock open. Trip valve open. Accumulator discharging to manifold.
C. Cock closed. Trip valve connected to pump inlet. Manifold spilling to atmosphere.

THE JET-ENGINE FUEL SYSTEM

thoroughly atomised and ignitable spray at the burners. A temporary increase in the flow is, therefore, provided by the hydraulic accumulator for starting purposes. On switching-on the starter motor the engine is rotated at about 1,200 r.p.m., giving a pump speed of about 200 r.p.m. and a fuel delivery at the rate of approximately 30 gal. per hour. This discharge forces the accumulator piston downwards against the loading springs, and when the accumulator is fully charged the pressure lifts the trip valve against its spring. Immediately the trip valve leaves its seating the pressure has effect on the full area of the supporting diaphragm, and the valve remains open until pressure has fallen to a very low value. There is thus a sharp discharge of fuel at a high rate of flow through the open high-pressure cock, the fuel manifold and the burners. When ignition has occurred, the engine accelerates rapidly and combustion is continued. Subsequently, the normal flow is then across the accumulator and through the high-pressure cock.

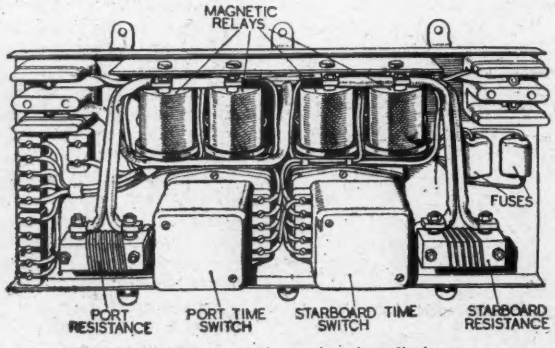


Fixed-orifice burner with sectioned detail of swirl chamber.

When the engine is shut down by closing the pressure cock, the accumulator discharges through the trip valve and along a slot in the rotor of the high-pressure cock to a ball-type relief valve and is returned to the suction side of the pump. Simultaneously the fuel in the manifold pipe is relieved through a drilling in the cock rotor and is passed by a drilling in the body to the underside of the accumulator piston and spilled to atmosphere. As the accumulator discharges, the springs return the piston to its original position, the trip valve closes and the unit is restored to the condition necessary for a further start. The flow through the accumulator unit under various conditions is shown in a diagram.

Fuel Burners

The burner, mounted in the end of the combustion chamber and spraying downstream in relation to the air flow, is of the fixed orifice, open type. Fuel is passed through a tubular gauze strainer (supported by a spring so that if completely clogged it will lift and be by-passed) to the interior of the burner body, in the end of which is mounted the atomiser. From the annular space between burner bore and atomiser the fuel enters the conical atomiser chamber by three tangentially arranged holes, producing a rapid swirl. At the apex of the cone is a precisely calibrated orifice through which the fuel is projected in the form of a thin film which breaks up into a finely-atomised spray. The atomiser is secured to the burner by a flanged sleeve drawn up by the air shroud. The function of the shroud is to pass a controlled flow of air to the face of the atomiser to prevent the formation and build-up of carbon.



Starting panel for twin-engine installation.

It will have been noted that a considerable measure of automaticity has been achieved in the regulation of the various components. For starting-up the engine, however, a number of operations must be performed in a timed sequence. The problem is less complex for a turbine unit than for an equivalent piston engine, but to simplify the routine an electrically-operated system has been devised to carry-through the starting cycle automatically on depression of a starter button.

The starting routine is as follows:—

(1) Close master switch to energise the main supply circuit.

(2) Check throttle is closed and both low-pressure and high-pressure fuel cocks are open.

(3) Close safety switch to energise control circuit and start supply pump in tank.

(4) Depress starter button for one second.

When the button is operated, the electric motor of the time switch is run to wind-up the spring. Release of the button cuts out the motor, and the stored energy of the spring, operating through a ratchet wheel, begins to turn the switch selector cams. First movement of the cams closes a pair of contacts to energise a magnetic relay, which in turn completes the circuits for the starter motor and the booster coils for the igniter plugs. The starter begins to rotate slowly and to take up play in the engaging clutch. Simultaneously a second pair of contacts open so that the push-button circuit is broken to prevent inadvertent operation before the cycle is completed.

Two or three seconds after release of the button a third pair of contacts are closed and another magnetic relay short-circuits the starting resistance and applies full voltage to the starter. After a total delay of 30 seconds from the commencement of the cycle, the first and third contacts are opened and the second contacts closed to restore conditions for a repeat start. A sketch of the starting panel for a twin-engine installation is given in an illustration. Usually only two igniter plugs are employed, as once ignition has been initiated the flame immediately flashes to other combustion chambers through the interconnecting tubes.

FIREFLIES FOR THE DUTCH NAVY

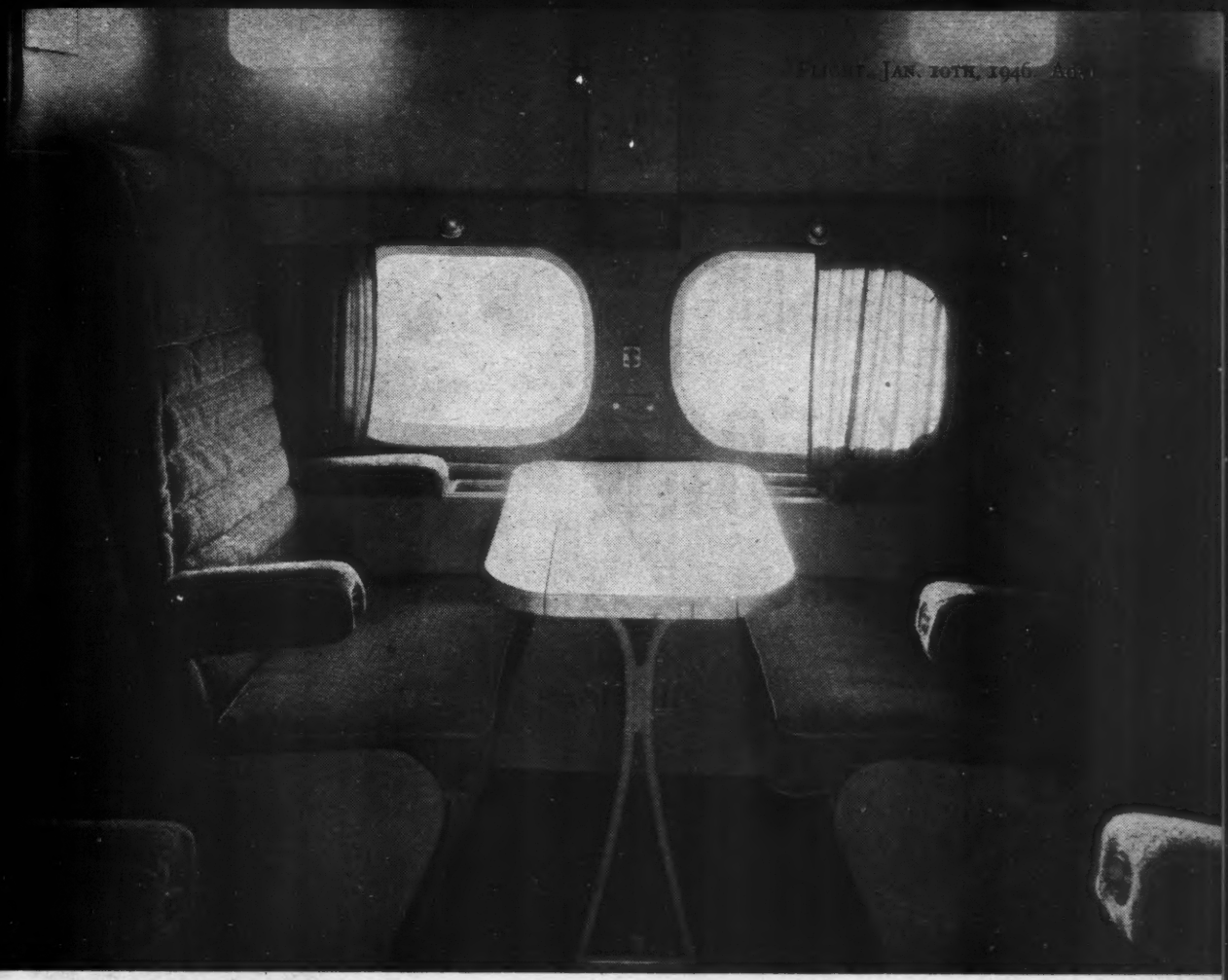
THE Royal Netherlands Navy is to equip its Air Arm with British aircraft, and a number of Fairey Firefly two-seater reconnaissance fighters has been ordered by the Dutch Minister of Naval Affairs. These aircraft will be supplied by the factory at Hayes, and deliveries begin immediately.

The Firefly, which was the first British aircraft to fly over Tokyo, is the standard two-seater fighter reconnaissance aircraft of the Royal Navy. It is powered by a 1,550 h.p. Rolls-Royce Griffon engine and is designed throughout for carrier operation.

ILIFFE JOURNALS ON SHOW

THE first post-war trade exhibition of its size, the Gauge and Tool Makers' 1946 Exhibition, opened at the New Horticultural Hall, Vincent Square, S.W.1, at 11 a.m. on Monday, January 7, and remains open daily between 10 a.m. and 8 p.m. until Friday, January 18. One of its principal objects is to stimulate export trade.

Associated Iliffe Press, as would be expected of the largest publishers of their type in the world, have a brilliantly illuminated stand of modern design in the centre of the hall, on which overseas and home buyers will find technical, trade and specialised journals dealing authoritatively with many of Britain's industries. Journals with a particular appeal to gauge and tool makers and users prominently featured on the Iliffe Stand (No. 71) include *Aircraft Production, Automobile Engineer, British Engineering Export Journal, Machine Shop Magazine, British Plastics, Electrical Review, Export Trader, Flight, Iron & Steel, Mechanical Handling, Metal Industry, Motor Trader* and *Welding*; a selection from the current range of 120 text-books is also displayed.



SANDRINGHAM

A luxury Flying Boat conveying 24 passengers by day, sleeping 16 by night, and fitted with dressing rooms, a dining saloon and cocktail bar, two decks and adequate unobstructed windows. Consideration for passenger comfort, combined with flying boat safety and reliability, proven by years of experience — civil transport needs these features.

EMPIRE FLYING BOAT CANOPUS RECENTLY CELEBRATED HER NINTH BIRTHDAY. HAVING FLOWN 1,700,000 MILES.

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SHORT BROS. (ROCHESTER & BEDFORD) LTD., SEAPLANE WORKS, ROCHESTER, KENT

SHORT & HARLAND LIMITED, QUEENS ISLAND, BELFAST, N. IRELAND

Robert Sharp & Partners

Take your seats for Johannesburg!

SPRINGBOK SERVICE BY AVRO YORK

averages over 210 m.p.h!

To re-open the direct service between England and South Africa, British Overseas Airways Corporation and South African Airways chose the Avro York. Carrying 12 passengers in addition to mail cargo and, on intermediate sectors 4 extra passengers, the York is scheduled to fly the 6,835 statute miles between Hurn and Johannesburg in 32 hours 25 minutes flying time. Another direct Empire air service inaugurated by Avro!

The Silver York ready for the first trip to Johannesburg.

A superplane by AVRO

CIVIL AVIATION NEWS

B.O.A.C. CHANGES

EARLY this month the B.O.A.C. landplane service to Karachi was extended to Calcutta, with one stop for the Yorks at Delhi. At the same time the Dutch K.L.M. service to Lisbon, which is operated five times weekly, and to Gibraltar, once weekly, have been taken over, while the frequency of the Stockholm service has been increased.

THE FIRST CHARTER

ALTHOUGH by no means the only concern preparing for charter operations in and from this country, Cambrian Air Services, of Cardiff, were the first to start work in, so to speak, an official capacity. At a luncheon given on the very first day of their "freedom," Mr. S. Kenneth Davies, the managing director, outlined the special advantages of charter operations from the business point of view in comparison with the more immutable movements of regular air services.

MORE DC-3s FOR TATA

A FURTHER ten Douglas aircraft have recently been purchased by Tata Air Lines from the U.S. Liquidation Commission. The company now has twelve such aircraft: eight C-47s, two C-53s and two C-48s—all of them, of course, variants of the civil DC-3, or Dakota.

Another Indian air transport firm was formed recently for operation within the State of Hyderabad. This is known as Deccan Airways and the company's base will be at Hyderabad.

CANADIAN NEWS

A PLAN to carry all first-class mail by air is now being laid before the Canadian Parliament.

Colonial Airlines is to start a service from Ottawa, via Montreal, to New York early this year, having purchased new DC-3 aircraft for this purpose. Colonial has also ordered twenty Martin 202 forty-passenger aircraft for delivery in 1947 and for use on the Montreal-New York run, on which a 75-minute non-stop trip will be offered.

A. V. Roe (Canada), Ltd., is to purchase the Canadian Government's wartime-built Victory Aircraft works, where Lancaster and Lincoln bombers are being built, and the plant will be operated jointly with the Canadian Government.

The de Havilland Aircraft of Canada has started the re-production of the de Havilland Fox Moth, for both Canadian and British markets.

A general investigation of tailless aircraft is being conducted by the Government's National Research Council at Ottawa. This includes wind-tunnel work as well as flight trials of a model, to study stability and control. This model has a 47ft. span and maximum weight of 4,000 lb. Both pilot and observer are carried, with dual control, and a tricycle landing gear is fitted.

COLONIAL CHANGES

IN the course of a lecture on flying in the Colonies given recently by Mr. B. C. H. Cross, the Air Transport Adviser to the Colonial Office, one or two not very well known facts were given of the incidental services in different colonies.

In *Flight* of December 13th we said something of the work of British West Indian Airways, operating from Trinidad, and of the "one-man" efforts of Major Williams and his Ireland amphibians of British Guiana Airways. In addition to these companies, there are one or two others in the Central American area about which little has been heard. For instance, there is a concern called Bahamas Airways, operating from Nassau and employing a single Douglas Dolphin amphibian of early vintage. In British Honduras a local service from Belize has been built up by a New Zealander to give charter facilities from various landing strips. Mr. Cross suggests that for operations in the West Indies area a really efficient medium-sized commercial amphibian would have very considerable possibilities if this could be built both to be seaworthy and to carry a useful payload.

In East Africa local needs before the war were filled by Wilson Airways, and three or four of their original Rapides are still in use. The work has now been taken over by a B.O.A.C. subsidiary with six D.H. Dominies based on Nairobi, and Mr. Cross considers that a modern variation of this type is still the most suitable for work in this and similar areas.

Farther south, the original Rhodesia and Nyasaland Airways, a company associated with Imperial Airways, has been reformed into a Government-owned concern known as Central African Airways. This will operate regional services between South Africa, the Rhodesias and East Africa, while, at the same time, developing local services.

AND NOW FRANCE

A PROVISIONAL agreement has been reached between the U.S. and French Governments for the mutual operation of transatlantic services. France is to provide facilities for American aircraft flying between the U.S., Paris and Calcutta, with branch lines extending elsewhere in Europe and the Middle East, and between the U.S. and Marseilles, via Lisbon and Barcelona. In return, Air France will receive the same facilities in America for services to New York and Washington, and to Chicago, via Montreal.

THE BERMUDA SERVICE

JUST before the New Year Pan American Airways announced the discontinuance of their boat service between New York and Bermuda and this will by now have been taken over by landplanes since temporary permission has been obtained for the use of Kindley Field—the only airport on the island. Apparently P.A.A. now have a sufficient number of Skymasters to permit both a daily service across the North Atlantic and a twice-weekly service to Bermuda. At the moment B.O.A.C. is running three return trips from Baltimore to Bermuda with one of their Boeing Clippers, the other two being used on the Atlantic service.

CIVIL AIRWORTHINESS REQUIREMENTS

WITH the introduction of officially permitted civil flying, the Air Registration Board has issued a folder giving the necessary information about present-day civil airworthiness requirements. The necessary procedure is outlined for the issue and renewal of certificates of airworthiness, for the approval of ancillary items, for aircraft maintenance, and for the issue and renewal of aircraft engineers' licences. The section dealing with design and construction performance requirements covers all the outstanding points, including those concerning initial climb and engine failure considerations. The fire precautions are much more thorough than those in force in pre-war years, and the necessity for induction system de-icing is impressed and methods of protection recommended, the designer being free to select that most suitable.

THE FIRST CIVIL INSTRUCTION

SO far as we can discover, the only private flying school or club to start operations on January 1st was that at Cambridge. Here, incidentally, is one of the only six points where, for the moment, 73 and 83 octane fuel can be obtained. Marshall's flying school has made a start, using one Tiger Moth for training and one Falcon Major for other purposes, and the rates for instruction, at least until some subsidy scheme is instituted, are £5 10s. an hour. Orders have been placed for three additional aircraft—a Miles Messenger, a Percival Proctor and a D.H. Rapide—and it is to be presumed that more Tiger Moths will also be used when these are obtainable. The chief instructor is Sqn. Ldr. L. V. Worsdell, D.F.C.

THE LONDON CLUB

WHETHER or not a subsidy is available, or the subsidy terms announced in good time, the old London Aeroplane Club will be resuming operations, using Tiger Moths, early this year. Its headquarters will no longer be at Hatfield, since such incidental flying would interfere with more serious test work there, and the club has arranged to use Panshanger, a grass airfield between Hatfield and Hertford.

This is still, officially, an R.A.F. station, but Wing. Cdr. J. A. Harris who, for six years previous to the war, was chief instructor, has taken up a tactical position there and will be glad to hear from old and new members. Since the Post Office may not yet be prepared to give the telephone numbers of R.A.F. airfields, we should say that the number is Essendon 301, and that Wing Cdr. Harris's extension is 11.

New Year Honours

Further Names from First List : R.A.F. and Empire Air Forces Awards

IN addition to the preliminary list of recipients of New Year Honours given on page 7 of last week's issue, the following names of those connected with aviation either in a Service or civilian capacity are among those announced in the first full list.

BARON

Marshal of the R.A.F. Sir Arthur Tedder.

KNIGHTS BACHELOR

F. J. E. Brake, Controller of Construction and Regional Services, M.A.P.; S. J. Brown, lately Under-Secretary, M.A.P.; Prof. I. M. Heilbron, lately Scientific Adviser, Min. of Production; W. G. V. Smith, chairman, Bristol Aeroplane Co.

Mr. W. G. Verdon Smith, Chairman of the Bristol Aeroplane Co.—a Knighthood.

ORDER OF THE BATH

(Military Division)

C.B.

Air Vice-Marshal G. H. Ambler, A.A.F.; Air Vice-Marshal F. J. Fogarty, R.A.F.; Air Vice-Marshal A. F. Rook, F.R.C.P., R.A.F.; Air Vice-Marshal R. S. Blucke, R.A.F.; Air Vice-Marshal D. A. Boyle, R.A.F.; Air Vice-Marshal H. A. Constantine, R.A.F.; Air Vice-Marshal E. J. Cuckney, R.A.F.; Air Vice-Marshal G. Harcourt-Smith, R.A.F.; Air Vice-Marshal F. F. Inglis, R.A.F.; Air Vice-Marshal A. F. Lang, R.A.F.; Air Vice-Marshal C. W. Weedon, R.A.F.; Air Vice-Marshal J. R. Whitley, R.A.F.; Air Vice-Marshal W. M. Yool, R.A.F.

Air Comdre. G. G. Banting, R.A.F.; Air Comdre. A. Hesketh, R.A.F.; Air Comdre. H. W. Heslop, R.A.F.; Air Comdre. G. S. Hodson, R.A.F.; Air Comdre. H. D. Jackman, R.A.F.; Air Comdre. J. L. Kirby, R.A.F.; Air Comdre. F. W. Long, R.A.F.; Air Comdre. H. J. Roach, R.A.F.; Air Comdre. C. G. Smith, R.A.F.; Air Comdre. G. F. Smylie, R.A.F.; Air Comdre. C. G. Wigglesworth, R.A.F.

Air Comdre. H. L. Woolveridge, R.A.F.; Air Comdre. N. S. Allinson, R.A.F.; Air Comdre. F. R. Banks, R.A.F.; Air Comdre. C. D. C. Boyce, R.A.F.; Air Comdre. R. Byrne, R.A.F.; Air Comdre. H. I. Cozens, R.A.F.; Air Comdre. E. H. Fielden, R.A.F.; Air Comdre. L. G. Harvey, R.A.F.; Air Comdre. R. B. Lees, R.A.F.; Air Comdre. J. R. Mutch, R.A.F.; Air Comdre. N. S. Paynter, R.A.F.; Air Comdre. T. G. Pike, R.A.F.; Air Comdre. L. F. Sinclair, R.A.F.; Air Comdre. R. Woolley, R.A.F.; Grp. Capt. F. C. V. Laws, R.A.F.

Sir Arthur Street —G.C.B.

(Civil Division)

G.C.B.

Sir Arthur Street, Permanent Under-Sec. of State, Air Min., 1939-1945.

C.B.

S. Zuckerman, Scientific Director, R.A.F. Bombing Analysis Unit; R. V. Jones, Assistant Director of Intelligence (Science), Air Min. M. J. Dean, Principal Asst. Under-Sec. of State, Air Min.; F. C. Musgrave, Principal Asst. Sec., M.A.P.; Rear-Admiral G. P. Thomson, R.N. (Retd.), lately Chief Press Censor, M.O.I.

COMPANION OF HONOUR

Prof. A. V. Hill, a Secretary of the Royal Society.

ROYAL RED CROSS

M.R.R.C.

Matron O. A. Keyse, Matron R. E. C. Polus, P.M.R.A.F.N.S.; Matron E. M. Elder, R.C.A.F.N.S.

A.R.R.C.

Matron P. Garrard, Matron E. M. Marfleet, P.M.R.A.F.N.S.

Senior Sisters.— R. C. Black, M. P. Dawson, H. N. B. Grierson, D. Hughes, E. Jordan, all P.M.R.A.F.N.S.

Sisters.—M. H. Banks, K. S. Bentley, N. A. Braithwaite, J. Brown, S. L. Cover, J. Dore, M. I. Fowke, M. R. Hamilton, P. M. Halahan, J. Kenley, B. S. M. MacDonald, M. M. McHardy, M. R. Sandford, L. H. B. Spooner, J. A. Wright, all P.M.R.A.F.N.S.

ORDER OF THE INDIAN EMPIRE

K.C.I.E.

Sir G. V. Bewoor, Sec., Posts and Air Dept., India.

ORDER OF THE BRITISH EMPIRE

(Military Division).

C.B.E.

A.V-M. F. O. Cowtan, M.R.C.S., R.A.F.; A.V-M. G. A. H. Pidcock, R.A.F.; Air Comdre. K. Biggs, R.A.F.; Air Comdre. C. N. H. Bilney, R.A.F.; Air Comdre. E. I. Bussell, R.A.F.; Air Comdre. G. P. H. Carter, R.A.F.; Air Comdre. E. D. H. Davies, R.A.F.; Air Comdre. G. W. P. Grant, R.A.F.; Air Comdre. J. M. Mason, R.A.F.; Air Comdre. D. McLaren, R.A.F.; Air Comdre. H. J. G. E. Proud, R.A.F.; Air Comdre. E. H. Richardson, R.A.F.; Air Comdre. H. N. Thornton, R.A.F.; Air Comdre. S. N. Webster, R.A.F.; Air Comdre. J. J. Williamson, R.A.F.

Air Comdre. D. F. W. Atcherley, R.A.F.; Air Comdre. C. E. Benson, A.A.F.; Air Comdre. F. J. St. G. Braithwaite, R.A.F.; Air Comdre. R. A. Chisholm, A.A.F. R. of O.; Air Comdre. C. W. Dicken, R.A.F.; Air Comdre. A. Earle, R.A.F.; Air Comdre. S. C. Elworthy, R.A.F.; Air Comdre. H. A. Fenton, R.A.F.; Air Comdre. A. J. W. Geddes, R.A.F.; Air Comdre. C. M. Grierson, R.A.F.; Air Comdre. J. R. Hallings-Pott, R.A.F.; Air Comdre. J. G. Hawtrey, R.A.F.; Air Comdre. C. M. Heard, R.A.F.; Air Comdre. J. L. Hurley, R.C.A.F.; Air Comdre. D. W. Lane, R.A.F.

Air Comdre. W. M. L. Macdonald, R.A.F.; Air Comdre. F. R. Miller, R.C.A.F.; Air Comdre. R. L. Mills, R.A.F.; Air Comdre. F. J. Murphy, R.A.F.; Air Comdre. R. L. Phillips, R.A.F.; Air Comdre. S. L. G. Pope, R.A.F.; Air Comdre. N. C. Singer, R.A.F.; Air Comdre. G. R. C. Spencer, R.A.F.; Air Comdre. F. R. D. Swain, R.A.F.; Air Comdre. J. F. Titmas, R.A.F.; Air Comdre. R. N. Waite, R.A.F.; Air Comdre. J. B. Walmsley, R.A.F.; Air Comdre. I. L. Wincer, R.A.F.

Grp. Capt. T. M. Abraham, R.A.F.; Grp. Capt. B. Ball, R.A.F.; Grp. Capt. E. C. Bates, R.A.F.; Grp. Capt. E. T. Beer, R.A.F.; Grp. Capt. G. R. Brice, R.A.F.; Grp. Capt. S. A. J. Crummy, R.A.F.; Grp. Capt. F. C. Daubney, R.A.F.; Grp Capt. S. A. Dismore, R.A.F.; Grp. Capt. F. R. Drew, R.A.F.; Grp. Capt. W. F. Dry, R.A.F.; Grp. Capt. D. J. Eayrs, R.A.F.; Grp. Capt. K. H. R. Elliot, R.A.F.; Grp. Capt. J. A. Elliott, R.A.F.; Grp. Capt. R. H. E. Emson, R.A.F.; Grp. Capt. F. W. Felgate, R.A.F.; Grp. Capt. C. H. Flinn, R.A.F.

Grp. Capt. O. K. Griffin, R.A.F.; Grp. Capt. R. K. Hamblin, R.A.F.; Grp. Capt. G. N. Hancock, R.A.F.; Grp. Capt. J. A. Hawkins, R.A.F.; Grp. Capt. J. H. Hill, R.A.F.; Grp. Capt. E. A. Hodgson, R.A.F.; Grp. Capt. R. H. Horniman, R.A.F.; Grp. Capt. L. Horwood, R.A.F.; Grp. Capt. H. D. Humphreys, L.D.S., R.A.F.; Grp. Capt. J. W. Hunt, R.A.F.; Grp. Capt. W. H. Kyle, R.A.F.; Grp. Capt. H. G. Leonard-Williams, R.A.F.; Grp. Capt. M. Lowe, R.A.F.

Grp. Capt. J. A. McDonald, R.A.F.; Grp. Capt. C. C. McMullen, R.A.F.; Grp. Capt. G. R. Montgomery, R.A.F.; Grp. Capt. F. E. Nuttall, R.A.F.; Grp. Capt. H. D. O'Neill, R.A.F.; Grp. Capt. J. Constable-Roberts, R.A.F.; Grp. Capt. T. U. C. Shirley, R.A.F.; Grp. Capt. V. R. Smith, R.A.F.; Grp. Capt. W. J. G. Walker, R.A.F.; Grp. Capt. R. L. Wallace, R.A.F.; Grp. Capt. T. G. Waterlow, R.A.F.; Grp. Capt. M. Watson, R.A.F.; Grp. Capt. H. M. White, R.A.F.O.; Grp. Capt. C. B. Wincott, R.A.F.

Grp. Capt. E. R. Wood, R.A.F.; Grp. Capt. J. F. Young, R.A.F.; Grp. Capt. R. H. Young, R.A.F.; Col. S. F. Du Toit, S.A.A.F.; Grp. Capt. S. J. Bailey, R.A.F.; Grp. Capt. H. P. Broad, R.A.F.; Grp. Capt. G. N. Coward, R.A.F.; Grp. Capt. T. C. Dickens, R.A.F.; Grp. Capt. J. F. H. Du Boulay, R.A.F.; Grp. Capt. J. Cherry, A.A.F.E.O.; Grp. Capt. C. E. Foster, R.A.F.V.R.; Grp. Capt. P. S. Gomez, R.A.F.; Grp. Capt. G. E. Gordon-Duff, R.A.F.V.R.; Grp. Capt. H. E. Hills, A.A.F.; Grp Capt. L. A. Jackson, R.A.F.; Grp. Capt. E. G. L. Millington, R.A.F.; Grp. Capt. C. C. Morton, R.A.F.; Grp. Capt. P. J. Mote, R.A.F.

Grp. Capt. W. V. Nicholas, R.A.F.; Grp. Capt. A. H. Pearce, R.A.F.; Grp. Capt. P. J. A. Riddell, R.A.F.; Grp. Capt. F. J. Sherman, R.A.F.V.R.; Grp. Capt. G. A. Simons, R.A.F.; Grp. Capt. R. W. Stewart, R.A.F.; Grp. Capt. T. J. E. Thornton, R.A.F.; Grp. Capt. B. Thynne, R.A.F.; Grp. Capt. R. H. Waterhouse, R.A.F.O.; Grp. Capt. S. G. Wise, R.A.F.; the Rev. R. F. Diggle, R.A.F.; Wing Cdr. J. H. Harris, R.A.F.O.; Wing Cdr. A. W. Hunt R.A.F.; Wing Cdr. D. F. Spotswood, R.A.F.O.

Air Comdre. F. R. Banks—C.B.

O.B.E.

Air Comdre. B. F. Johnson, R.C.A.F.; Group Capt. T. E. H. Birley, R.A.F.V.R.; Group Capt. J. F. Bromley, R.A.F.V.R.; Group Capt. G. M. Buxton, R.A.F.; Group Capt. A. F. Cook, R.A.F.; Group Capt. N. C. Ogilvie-Forbes, R.A.F.; Group Capt. A. V. Hammond, R.A.F.; Group Capt. G. W. Hayes, R.A.F.; Group Capt. P. Haynes, R.A.F.; Group Capt. M. L. Heath, R.A.F.; Group Capt. J. M. Kilpatrick, M.B., B.Ch., R.A.F.; Group Capt. C. R. D. L. Lloyd, R.A.F.; Group Capt. I. R. Parker, A.A.F.; Group Capt. K. F. T. Pickles, R.A.F.; Group Capt. J. H. Powle, R.A.F.; Group Capt. W. C. Sheen, R.A.F.; Group Capt. F. A. R. Smith, R.A.F.; Group Capt. D. M. Somerville, R.A.F.; Group Capt. R. A. T. Stowell, R.A.F.; Group Capt. J. M. Warfield, R.A.F.; Group Capt. J. H. Woodin, R.A.F.

Group Capt. Viscount Acheson, R.A.F.; Group Capt. C. C. Bell, R.A.A.F.; Group Capt. A. M. Bentley, R.A.F.; Group Capt. A. C. Brown, R.A.F.O.; Group Capt. L. G. Burnand, R.A.F.O.; Group Capt. R. J. B. Burns, R.A.F.O.; Group Capt. B. S. Cartmel, R.A.F.; Group Capt. E. S. Borthwick-Clarke, R.A.F.; Group Capt. W. Corden, R.A.F.; Group Capt. J. S. Curtis, R.A.F.O.; Group Capt. V. Fairfield, R.A.F.; Group Capt. E. J. Fawdrey, R.A.F.V.R.; Group Capt. S. D. Felkin, R.A.F.V.R.; Group Capt. J. N. Jaquet, R.A.F.; Group Capt R. L. Kippenberger, R.A.F.; Group Capt. J. S. Laird, R.A.F.O.; Group Capt. J. McLaren, R.A.F.V.R.; Group Capt. A. D. Nesbitt, R.C.A.F.

Group Capt. L. R. Ridley, R.A.F.; Group Capt. H. V. Russell, R.A.F.; Group Capt. C. E. R. Tait, R.A.F.; Group Capt. C. W. B. Urmston, R.A.F.V.R.; Group Capt. E. E. Vielle, R.A.F.

Wing Cdr. J. F. H. Adams, R.A.F.V.R.; Wing Cdr. O. C. Barnett, R.A.F.V.R.; Wing Cdr. G. L. W. Boswell, R.A.F.O.; Wing Cdr. J. A. Chorlton, R.A.F.; Wing Cdr. W. B. Cleveland, R.C.A.F.; Wing Cdr. A. W. Coe, R.A.F.; Wing Cdr. B. G. Corry, A.A.F.E.O.; Wing Cdr. M. N. Crossley, R.A.F.O.; Wing Cdr. J. S. Darrant, R.A.F.; Wing Cdr. L. Davey, R.A.F.; Wing Cdr. B. O. Dias, R.A.F.O.; Wing Cdr. H. R. F. Dyer, R.C.A.F.

Wing Cdr. A. J. Edmunds, R.A.F.; Wing Cdr. J. V. Edwards, R.A.F.V.R.; Wing Cdr. R. W. Edwards, R.A.F.V.R.; Wing Cdr. A. J. Elliott, R.A.F.O.; Wing Cdr. F. E. Everard, R.A.F.V.R.; Wing Cdr. R. A. Foggin, R.A.F.; Wing Cdr. A. J. E. Forsyth, R.A.F.V.R.; Wing Cdr. E. H. Free, R.A.F.; Wing Cdr. H. Furner, R.A.F.; Wing Cdr. F. P. Gee, R.A.F.

(To be continued.)

See the Properties of FEROBESTOS Technical Plastics

Physical & Mechanical Properties of FEROBESTOS

Grade	EF	LA	LF
Base	Asbestos Non-woven	Asbestos Cloth Heavy Weave	Asbestos Cloth Fine Weave
Tensile Strength (lb./sq. in.)	27,000	7,000	12,000
Compressive Strength (lb./sq. in.)	65,000	34,000	42,000
Shear Strength (lb./sq. in.)	18,000	11,000	15,000
Cross-breaking Strength (lb./sq. in.)	29,000	14,000	19,000
Impact Strength (ft./lb.)	5	2.5	4
Fatigue Strength (tons/sq. in.)	3.75	1.0	2.25
Density (Gm./c.c.)	1.87	1.67	1.74

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CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

SCOPE FOR PRIVATE ENTERPRISE

In Large-scale Charter Air Services

THE announcement that charter air services are to be allotted a petrol ration sufficient for 60 hr. flying a month is welcome news.

It brings to mind, however, a question which seems worthy of note; that of what legally constitutes a charter air service. What is, in fact, to prevent such services from becoming of such size and scope that they are potential airlines, even though in name they are registered as charter companies?

In the past there was probably no attempt to build up any particular charter service into a large organisation, since the operation of an airline was open to those inclined to large-scale management. With Government control of airlines, however, there might be a tendency to expand private charter services to a degree not previously contemplated. Provided no limit is placed on the size of aircraft to be used and the chief restriction is that no scheduled services be operated, there would seem to be scope for not inconsiderable private enterprise, unless the Government's own charter services are very economical as far as passengers are concerned!

DOUGLAS DEANS.

NATIONALISED AIRWAYS

Destructive Bias Does Not Help

I SEE in my copy of *Flight* (December 13th) that a correspondent has taken up the argument against nationalising the airways. It is unfortunate that he should choose myself as the object of his wrath; if he will read my letter again he will see that I did not, as he asserts, *defend* this latest step of the Socialist Government. I hoped merely to point out that it could be of no help to anyone to take up the biased, destructive attitude that Mr. Feverheerd has shown.

In reply to Mr. Garmeson's questions I would say that:

(i) The Government has shown spite and a fear of its own weakness by cutting out possible British competition.

(ii) To his other several questions I would say that it is only too obvious that the Government will be absolutely uncompromising (and therefore *undemocratic*) as far as this matter is concerned. We can hope for no measure of consent to return to the old system which, unfortunately, never showed what it *could* do. We can only hope that the Government will make it their concern that the new system functions well enough for Britain to hold her own against possible rivals.

Whether this will happen or not remains to be seen. The best thing that could be done, of course, would be to let the old operators—the men of knowledge—run the airlines for the Government. Could this happen?

D. HAYNES.

THE LONG-DISTANCE RECORD

The Truth, the Whole Truth . . .

READING John Grierson's letter in *Flight*, December 20th, 1945, causes one to remember that the Wellesleys which set up the long-distance record in 1938 had one engine per machine—and that of only 1,010 horse-power. The Superfortress has four engines whose total output is just about eight times that of the Wellesley's one; also, the span of the Superfortress is just about twice that of the Wellesley, and the crew carried by the record Superfortress was probably five times as large as that carried by each record-breaking Wellesley. The increase over the old record is about 1,040 miles. I think Mr. Grierson might do better to consider these facts than trust to those he gleans from the various newspapers.

Surely Mr. Grierson does an injustice to Bomber Command and Coastal Command when he says the high-light of the R.A.F. was its fighter strength.

I wonder what range a specially groomed Lancaster would have in view of its tremendous lifting powers, and assuming that fuel consumption of a 1,260 h.p. engine is less than that of a 2,200 h.p. engine? I suppose also that some slight gain in performance would result from the removal of turrets. [The Lancastrian has proved this.—ED.]

To switch to a different subject—"Kibitzer's" article in your December 27th, 1945, issue. Surely Britain cannot be blamed for the fact that American magazines and newspapers do not seem to mind whether they print untruths—untruths so transparent that they must surely be recognised as such at first glance. I wonder whence these absurdities (which seem to be so frequent) originate? Can Britain be accused, with any sincerity, of similarly outraging the truth?

If the American Government is as keen on Anglo-American friendship as it is supposed to be, then surely some measure of control is indicated to ensure that untruths are not broadcast willy-nilly. And if direct untruths are considered preferable to insidious half-truths, that they are quickly and widely shown up as such.

I might add that when viewed through American eyes, anything that seems likely to benefit Americans at someone else's expense would seem to be regarded as logical.

"Natural Wealth, as it is most advantageous, so doth it make the people careless, proud, and given to all excesses."

A. SANSOM.

TWIN TRAINERS

Visiting Flights and C.F.I.s

IN his reply to my letter (*Flight*, November 29th, 1945), "Ulysses" (*Flight*, December 20th, 1945) conveniently disregards my reference to AP. 1732B in connection with the correction of swings on landing in twin-engined aircraft. Perhaps I should have quoted CAP. 1 Vol. 2 (third edition), which is the Canadian version of precisely the same book, word for word and letter for letter. However, a further brief question may be in order. Is it better to apply rudder in the desired direction *prior* to "giving her the gun" when a swing occurs? I think the answer will be "yes," because if you intend to increase the effectiveness of your control surface it is essential that that surface, i.e., the rudder, is turned in the desired direction to prevent further swing.

Your correspondent's claim that it was "common practice" to use the inside engine (no mention of any other action!) hardly holds water as the writer has worked both with the R.A.F. and the R.C.A.F. in Canada for a considerable period and has "seen for himself."

Regarding divergence of opinion between visiting flights and C.F.I.s, this, too, has been experienced, and, of course, is perfectly true. Intelligent discussion between experts is usually worth while and tends to stimulate enthusiasm in others! Since, however, no member of any visiting flight in the R.C.A.F. will claim to be proficient at three-pointing the Oxford, their opinions would be better left out of this particular bone of contention. Having tested and categorised several of the various visiting flight members in Canada, I have been in the happy position of observing from very close range the various reactions of those who occupy the "seats of the mighty," and I would add to this that the C.F.S. (Canada) instructors are among the finest in the world.

"Ulysses," in paragraph 3, mentions some instructors who are lacking in self-respect. I do not consider them as "instructors"—"drones" would more aptly describe them. However, with the advent of peace in our time the instructors' profession is on the upgrade again and it will be considered a privilege to teach others to fly.

In paragraph 6 of his letter "Ulysses" regards three-point landings as "archaic"—ah, well, Confucius, he say, "softly, softly, catchee monkey," or words to that effect. Suffice it to say, that one of the greatest aeronautical authorities of our times (Wing Cdr. A. C. Kermode, O.B.E., in his book "Mechanics of Flight," Vol. 1, fourth edition, page 98) maintains that "the art of landing an aircraft consists of bringing it in contact with the ground at the lowest possible vertical velocity and, at the same time, the lowest possible horizontal velocity relative to the ground."

Now, which is the better way to do it, wheeler or three-point?

Reference to T.C.A. is pointless in this regard as civilian airlines endeavour (one hopes) to make their fare-paying passengers as comfortable as possible. It can be stated then, that unless the angle of attack of the mainplane is utilised in an endeavour to come in slowly, coupled with intelligent engine-handling, your touch-down speed will be anything but the slowest.

In conclusion, may I add that it is unfortunate that "Ulysses" is returning home so soon. One can almost picture the set-up and imagine the interesting discussions taking place just as our old Oxford was being three-pointed—i.e., landed at the *correct* speed.

"AYEONE"

ON ACTIVE SERVICE: A line-up of some of the aircraft used by the R.A.F. in Java, in operations supporting the 5th Indian Division. The aircraft shown are Thunderbolts, Catalinas, Mitchells, Mosquitos and a Dakota.

SERVICE AVIATION

Royal Air Force and Naval Air Arm News and Announcements

Promotions

THE KING has been graciously pleased to approve the following promotions, with effect from January 1st, 1946, in recognition of distinguished service during the war in Europe:—

To be Marshals of the Royal Air Force

Air Chief Marshal Sir W. Sholto DOUGLAS, K.C.B., M.C., D.F.C.

Air Chief Marshal Sir Arthur T. HARRIS, G.C.B., O.B.E., A.F.C.

Appointment

Medical Branch.

AIR VICE-MARSHAL T. J. KELLY, C.B.E., M.C, M.D., B.Ch., is appointed an Honorary Surgeon to the King in succession to Air Vice-Marshal F. O. Cowtan, C.B., M.R.C.S., L.R.C.P., who vacates the appointment on retirement from the R.A.F.

Awards

Naval Air Arm

Distinguished Service Cross

Act. Temp. Lt. Cdr. (A) D. B. LAW, R.N.V.R. —For bravery, skill and endurance whilst engaged in air strikes against Japanese airfields in Puket Island, Salang, during July, 1945.

Royal Air Force

THE KING has been graciously pleased to approve the following awards in recognition of gallantry and devotion to duty in the execution of air operations.

Distinguished Service Order

Act. Wing Cdr. R. O. ALTMANN, D.F.C., R.A.F.O., No. 31 Sqn.—Since being awarded the D.F.C. this officer has completed a second tour of operational duty with Bomber Command. He then commenced a third tour of duty with Transport Command, during which he flew on many day and night sorties and has participated in glider tows at Arnhem and during the invasion of Europe. Since assuming command of his present squadron Wing Cdr. Altmann has flown on many supply dropping operations in Burma. Throughout a long and distinguished service career, this officer has consistently displayed exceptional keenness and enthusiasm for his work, courage and great devotion to duty. Under his inspiring leadership his squadron has accomplished some excellent work.

Sqn. Ldr. D. K. MCDONALD, R.A.A.F., No. 134 Sqn.—Sqn. Ldr. McDonald has been engaged in air operations in the far eastern theatre of war since the fall of Singapore. For a considerable period he has commanded his present squadron which he has maintained at a high level of operational efficiency. During the advance of the 14th Army he has led the squadron continuously on close support operations, achieving brilliant results during the Mandalay-Rangoon phase of the campaign. Although suffering many handicaps during this period, arising from the difficult nature of the terrain and the adverse weather which was frequently encountered, the squadron has achieved great success, much of which can be ascribed to the enthusiasm, courage and ability of Sqn. Ldr. McDonald.

Distinguished Flying Cross

F/O. O. A. MARSHALL, R.A.A.F., No. 78 Sqn.
F/O. R. J. MORAN, R.A.A.F., No. 550 Sqn.
F/O. A. J. ROSE, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
F/O. P. B. ROSENHAIN, R.A.A.F., No. 15 Sqn.
F/O. R. G. RUSSELL, R.A.A.F., No. 466 (R.A.A.F.) Sqn.
F/O. L. G. SENGER, R.A.A.F., No. 101 Sqn.
F/O. R. K. STRINGER, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
F/O. R. G. THORNE, R.A.A.F., No. 10 Sqn.
F/O. T. P. TOBIN, R.A.A.F., No. 153 Sqn.
F/O. J. F. WARNES, R.A.A.F., No. 10 Sqn.
F/O. A. H. WILLMORE, R.A.A.F., No. 582 Sqn.
Act. F/O. K. McK. ANDERSON, R.A.A.F., No. 158 Sqn.
Act. F/O. I. S. SMITH, R.A.A.F., No. 10 Sqn.
P/O. J. ASHURT, R.A.A.F., No. 466 (R.A.A.F.) Sqn.
P/O. A. E. ANDERSON, R.A.A.F., No. 158 Sqn
P/O. S. J. BOOTH, R.A.A.F., No. 635 Sqn.
P/O. A. W. BROWN, R.A.A.F., No. 635 Sqn.
P/O. J. L. DALY, R.A.A.F., No. 101 Sqn.
P/O. F. U. DUTTON, R.A.A.F., No. 158 Sqn.
P/O. N. P. FORREST, R.A.A.F., No. 192 Sqn.
P/O. B. F. P. GODWIN, R.A.A.F., No. 466 (R.A.A.F.) Sqn.
P/O. W. A. GRANGER, R.A.A.F., No. 101 Sqn.
P/O. J. ILLA, R.A.A.F., No. 10 Sqn.
P/O. R. D. JOHNSTON, R.A.A.F., No. 142 Sqn.
P/O. W. R. KELLEHER, R.A.A.F., No. 102 Sqn.
P/O. M. H. H. LEVERSHA, R.A.A.F., No. 166 Sqn.
P/O. J. A. MCCLEAN, R.A.A.F., No. 466 (R.A.A.F.) Sqn.
P/O. D. NORTHRIDGE, R.A.A.F., No. 142 Sqn.
P/O. R. E. PAECH, R.A.A.F., No. 156 Sqn.
P/O. T. W. PETERS, R.A.A.F., No. 640 Sqn.
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P/O. W. P. STRACHAN, R.A.A.F., No. 158 Sqn.
P/O. L. F. TALTY, R.A.A.F., No. 635 Sqn.
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P/O. R. V. WOOD, R.A.A.F., No. 466 (R.A.A.F.) Sqn.
P/O. J. D. YOUNG, R.A.A.F., No. 10 Sqn.
W/O. A. W. MCILRATH (now P/O.), R.A.A.F., No. 582 Sqn.
F/O. R. N. FULLER, R.C.A.F., No. 426 (R.C.A.F.) Sqn.
F/O. L. L. GALBRAITH, R.C.A.F., No. 12 Sqn.
F/O. E. N. GILDNER, R.C.A.F., No. 428 (R.C.A.F.) Sqn.
F/O. A. GONOR, R.C.A.F., No. 156 Sqn
F/O. J. S. GORDON, R.C.A.F., No. 42 (R.C.A.F.) Sqn.
F/O. G. V. GRAHAM, R.C.A.F., No. 78 Sqn.
F/O. M. G. GUTHMAN, R.C.A.F., No. 424 (R.C.A.F.) Sqn.
F/O. C. E. R. Y. HEBERT, R.C.A.F., No. 432 (R.C.A.F.) Sqn.
F/O. C. G. HEMMING, R.C.A.F., No. 432 (R.C.A.F.) Sqn.
F/O. D. H. HUDSON, R.C.A.F., No. 51 Sqn
F/O. H. E. HUNTER, R.C.A.F., No. 158 Sqn
F/O K. JOHNSON, R.C.A.F., No. 429 (R.C.A.F.) Sqn.
F/O. R. C. JOYNER, R.C.A.F., No. 419 (R.C.A.F.) Sqn.
F/O. R. J. KENDRICK, R.C.A.F., No. 432 (R.C.A.F.) Sqn.
F/O. M. S. LAIDLAW, R.C.A.F., No. 405 (R.C.A.F.) Sqn.
F/O. L. P. H. LAPOINTE, R.C.A.F., No 101 Sqn.
F/O. C. B. LEGROS, R.C.A.F., No. 405 (R.C.A.F.) Sqn.
F/O. W. J. MANION, R.C.A.F., No. 429 (R.C.A.F.) Sqn.
F/O. E. F. MARRITT, R.C.A.F., No. 428 (R.C.A.F.) Sqn.
F/O. R. W. MARTIN, R.C.A.F., No. 103 Sqn.
F/O. J. H. MCGEOUGH, R.C.A.F., No. 166 Sqn.
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F/O. J. O. MCDONALD, R.C.A.F., No. 433 (R.C.A.F.) Sqn.
F/O. E. R. MCINTOSH, R.C.A.F., No. 405 (R.C.A.F.) Sqn.
F/O. W. H. MCKAY, R.C.A.F., No. 432 (R.C.A.F.) Sqn.
F/O. J. A. MCKINLAY, R.C.A.F., No. 405 (R.C.A.F.) Sqn.
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F/O. M. MCNATH, R.C.A.F., No. 35 Sqn.
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F/O. N. A. PACKER, R.C.A.F., No. 158 Sqn.
F/O. W. D. PETERS, R.C.A.F., No. 158 Sqn.
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F/O. J. R. RICHES, R.C.A.F., No. 426 (R.C.A.F.) Sqn.
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F/O. F. H. ROWAN, R.C.A.F., No. 514 Sqn.
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F/O. J. L. WHITNEY, R.C.A.F., No. 426 (R.C.A.F.) Sqn.
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P/O. R. ANDREW, R.C.A.F., No. 419 (R.C.A.F.) Sqn.
P/O. H. J. G. BEILHARTZ, R.C.A.F., No. 415 (R.C.A.F.) Sqn.
P/O. W. L. BOUVIER, R.C.A.F., No. 428 (R.C.A.F.) Sqn.
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P/O. J. A. CREW, R.C.A.F., No. 582 Sqn.
P/O. M. CYR, R.C.A.F., No. 429 (R.C.A.F.) Sqn.
P/O. G. C. GERRIE, R.C.A.F., No. 415 (R.C.A.F.) Sqn.
P/O. R. G. GRIBLING, R.C.A.F., No. 426 (R.C.A.F.) Sqn.
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Flt. Lt. J. S. ETHERINGTON, R.A.F.V.R., No. 128 Sqn.
Flt. Lt. M. A. EYRE, R.A.F.V.R., No. 630 Sqn.
Flt. Lt. J. R. FORSYTHE, R.A.F.V.R., No. 625 Sqn.
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F/O. G. W. BARTLETT, R.A.F.V.R., No. 35 Sqn.
F/O. L. J. BARTLETT, R.A.F.V.R., No. 195 Sqn.
F/O. R. BEECH, R.A.F.V.R., No. 35 Sqn.
F/O. C. C. BEVAN, R.A.F.V.R., No. 163 Sqn.
F/O. D. F. BIRD, R.A.F.V.R., No. 128 Sqn.
F/O. D. C. BOA, R.A.F.V.R., No. 105 Sqn.
F/O. L. BOOT, D.F.M., R.A.F.V.R., No. 223 Sqn.
F/O. J. M. BRENNAN, R.A.F.V.R., No. 78 Sqn.
F/O. J. E. BROOKES, R.A.F.V.R., No. 10 Sqn.
F/O. N. F. BYATT, R.A.F.V.R., No. 128 Sqn.
F/O. J. T. BURKE, R.A.F.V.R., No. 101 Sqn.
F/O. D. J. CARTER, R.A.F.V.R., No. 625 Sqn.
F/O. H. E. CHANDLER, R.A.F.V.R., No. 622 Sqn.
F/O. H. J. CLAYTON, R.A.F.V.R., No. 15 Sqn.
F/O. D. A. C. M. COMER, R.A.F., No. 51 Sqn.
F/O. R. J. CORNISH, R.A.F.V.R., No. 195 Sqn.
F/O. J. A. I. COYNE, R.A.F., No. 463 (R.A.A.F.) Sqn.
F/O. C. M. DANINO, R.A.F.V.R., No. 582 Sqn.
Wing Cdr. H. A. R. HOLDFORD, O.B.E., R.A.F.O., No. 51 Sqn.
Act. Wing Cdr. D. F. HYLAND-SMITH, R.A.F.O., No. 102 Sqn.
Act. Sqn. Ldr. C. S. JOHNSON, R.A.F., No. 100 Sqn.
Flt. Lt. G. ARBAND, R.A.F.V.R., No. 186 Sqn.
Flt. Lt. A. W. COXALL, R.A.F.V.R., No. 186 Sqn.
Flt. Lt. T. N. EVANS, R.A.F.V.R., No. 550 Sqn.
Flt. Lt. D. ELLIOTT, R.A.F.V.R., No. 192 Sqn.
Flt. Lt. L. G. HARDY, R.A.F.V.R., No. 626 Sqn.
Flt. Lt. J. C. HARRISON, R.A.F.V.R., No. 207 Sqn.
Flt. Lt. A. K. HOLT, R.A.F.V.R., No. 115 Sqn.
Flt. Lt. L. E. JORDAN, R.A.F.V.R., No. 186 Sqn.
Flt. Lt. R. G. LANGRIDGE, R.A.F.V.R., No. 57 Sqn.
Flt. Lt. M. LEVY, R.A.F.V.R., No. 223 Sqn.
Flt. Lt. D. F. MCILROY, R.A.F.V.R., No. 199 Sqn.
Flt. Lt. A. J. NEVILLE, R.A.F.V.R.
Flt. Lt. S. REED, R.A.F.V.R., No. 223 Sqn.
Flt. Lt. C. C. ROGERS, R.A.F.V.R., No. 101 Sqn.
Flt. Lt. A. S. SMITH, R.A.F.V.R., No. 514 Sqn.
Flt. Lt. R. G. STANLEY, R.A.F.V.R., No. 626 Sqn.
Flt. Lt. W. S. STEPHENS, R.A.F.V.R., No. 223 Sqn.
Flt. Lt. W. R. THOMPSON, R.A.F.V.R.
Flt. Lt. R. H. H. WILDER, R.A.F.V.R., No. 101 Sqn.
Flt. Lt. A. H. WILLIAMS, R.A.F.V.R., No. 223 Sqn.
Act. Flt. Lt. P. L. O. ASHENDEN, R.A.F.V.R., No. 170 Sqn.
Act. Flt. Lt. L. V. ROSSER, R.A.F.V.R., No. 115 Sqn.
F/O. R. D. CLOSE, R.A.F., No. 170 Sqn.
F/O. W. T. COOPER, R.A.F.V.R., No. 186 Sqn
F/O. J. D. C. COWL, R.A.F.V.R., No. 78 Sqn.
F/O. J. DADE, R.A.F.V.R., No. 10 Sqn.
F/O. G. E. GARDNER, R.A.F.V.R., No. 77 Sqn.
F/O. E. W. L. HALLAN, R.A.F.V.R., No. 115 Sqn.
F/O. H. W. LANGFORD, R.A.F.V.R., No. 153 Sqn.
F/O. R. W. MARSHALL, R.A.F.V.R., No. 427 (R.C.A.F.) Sqn.
F/O. R. MCAINSH, R.A.F.V.R., No. 170 Sqn.
F/O. J. NINIAN, R.A.F., No. 77 Sqn.
F/O. K. N. K. PATRICK, R.A.F.V.R., No. 170 Sqn.
F/O. R. PAY, R.A.F.V.R., No. 214 Sqn.
F/O. E. C. SMITH, R.A.F.V.R., No. 514 Sqn.
F/O. A. P. W. TAYLOR, R.A.F.V.R., No. 76 Sqn.
F/O. V. J. TOWNSEND, R.A.F.V.R., No. 171 Sqn.
F/O. R. G. WATCHORN, R.A.F.V.R., No. 223 Sqn.
P/O. H. C. WEST, R.A.F.V.R., No. 76 Sqn.
P/O. G. C. K. GALLAGHER, R.A.F.V.R., No. 76 Sqn.
P/O. J. B. PORTWOOD, R.A.F.V.R., No. 76 Sqn.
P/O. J. A. TEBBUTT, R.A.F.V.R., No. 10 Sqn.
P/O. W. TREGILGAS, R.A.F.V.R., No. 78 Sqn.
W/O. J. E. BRITNELL, R.A.F.V.R., No. 75 (N.Z.) Sqn.
W/O. D. H. G. N. DANCY, R.A.F.V.R., No. 15 Sqn.
F/O. B. M. D'ARCY, R.A.F., No. 163 Sqn.
F/O. R. DEAKIN, R.A.F.V.R., No. 150 Sqn.
F/O. J. T. H. DE'MIDDLEMAER, R.A.F.V.R., No. 415 (R.C.A.F.) Sqn.
F/O. H. DEMPSTER, R.A.F.V.R., No. 149 Sqn.
F/O. L. DENNIS, R.A.F.V.R., No. 433 (R.C.A.F.) Sqn.
F/O. R. A. DENNY, R.A.F.V.R., No. 49 Sqn.
F/O. W. K. DIVES, R.A.F.V.R., No. 44 Sqn.
F/O. J. P. DOOLEY, R.A.F.V.R., No. 405 (R.C.A.F.) Sqn.
F/O. W. E. EVANS, R.A.F.V.R., No. 692 Sqn.
F/O. F. FAIRWEATHER, R.A.F.V.R., No. 51 Sqn.

Distinguished Flying Medal

Flt. Sgt. (now P/O.) J. P. W. HEPBURN, R.A.F.V.R., No. 186 Sqn.
Flt. Sgt. D. N. BEATTLE, R.A.A.F., No. 467 (R.A.A.F.) Sqn.
Flt. Sgt. W. KUCHMA, R.C.A.F., No. 431 (R.C.A.F.) Sqn.
Flt. Sgt. (now P/O.) W. O. BLYTHIN, R.A.F.V.R., No. 431 (R.C.A.F.) Sqn.
Flt. Sgt. W. A. CRAWSHAW, R.A.F.V.R., No. 49 Sqn.
Flt. Sgt. E. HALL, R.A.F.V.R., No. 207 Sqn.
Flt. Sgt. D. HENSHAW, R.A.F.V.R., No. 640 Sqn.

THE KING has been graciously pleased to approve the following awards in recognition of distinguished service:—

Distinguished Service Order

Sqn. Ldr. Count M. B. CZERNIN, M.C.C., D.F.C., R.A.F.

O.B.E. (Mil.)

Flt. Lt. M. ROWAN, R.A.F.V.R., No. 14 Ferry Unit.
Capt. A. W. SHORT, S.A.A.F., No. 15 (S.A.A.F.) Sqn.

Roll of Honour

Casualty Communiqué No. 558.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of the names in this list 252 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Flt. Sgt. H. A. Bell; Flt. Sgt. L. J. D. Gilyead; W/O. R. C. Impett; P/O. T. Lynn, D.F.M.; Flt. Sgt. D. Welch.

MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. J. W. Burdall; Flt. Sgt. G. Gibson; Sgt. J. Nicholson; Flt. Sgt. E. T. Sutton.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. L. Brotherhood; Sgt. R. L. Dicken; F/O. F. G. Dodd; Sgt. A. A. Humphris; Sgt. R. F. Leach; Sgt. J. L. Parker; Sgt. C. D. Woodruff.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. R. W. Abrams; F/O. F. Aiston; Sgt. K. G. Alsopp; Sgt. W. G. Amey; Sgt. J. Anderson; F/O. B. J. Atkin; Flt. Sgt. J. W. Austin; Sgt. A. C. H. Baker; Sgt. A. D. Baker; W/O. P. E. Bamford; Sgt. D. V. Barlow; Flt. Lt. R. F. Bass; Sgt. H. Beeson; Sgt. D. R. Bell; Sgt. F. W.

R.A.F. WAR COMMANDERS

Air Chief Marshal Sir Edgar Ludlow-Hewitt

(Caricature portrait by Hayden)

AIR CHIEF MARSHAL SIR EDGAR RAINEY LUDLOW-HEWITT, G.C.B., G.B.E., C.M.G., D.S.O., M.C., was educated at Radley and Sandhurst. In 1905 he was commissioned in the Royal Irish Rifles, and in August, 1914, was seconded to the Royal Flying Corps. He soon learnt to fly, and, having passed through the C.F.S., was posted to No. 1 Squadron, then in process of being raised. The original No. 1 had been an airship unit, and had been taken over by the Admiralty. Major Geoffrey Salmond led the new squadron oversea.

In France and Belgium young Ludlow-Hewitt soon distinguished himself, being mentioned in despatches six times, awarded the Military Cross, and in January, 1918, being made a Companion of the Distinguished Service Order. He also received a French decoration.

In 1926 Ludlow-Hewitt became the second Commandant of the R.A.F. College at Andover. In 1930 he was sent to Iraq as A.O.C. Iraq (then a mandated territory) was the first country under British control to be placed in the charge of the R.A.F. The motto of the Service there was "Control without Occupation." All units of other Services were under the orders of the A.O.C., who was responsible for external and internal security. The system proved a great success, and much credit is due to the early Air Officers who got it into working order.

Other important appointments in the R.A.F. followed, and at the outbreak of the second world war Ludlow-Hewitt was A.O.C.-in-C., Bomber Command. At first this Command had very slender resources, and in the early months of the war its chief activity was strewing propaganda leaflets over Germany, and incidentally learning the way to important centres which were afterwards bombed. Ludlow-Hewitt held this post until he was succeeded by "Bomber Harris."

In the New Year Honours List of 1946 Sir Edgar was promoted to Knight Grand Cross of the Order of the Bath.

SERVICE AVIATION

Bellamy; Flt. Sgt. S. C. Bennett; Sgt. R. Bentley; Sgt. A. W. Blake; Flt. Sgt. M. W. Blockley; Sgt. J. Blyth; Flt. Sgt. A. G. Boam; Sgt. R. W. Boss; F/O. A. E. Bothwell; Flt. Sgt. P. H. Bowen; Sgt. R. D. J. C. Carling; Sgt. D. Carter; Flt. Sgt. L. H. Chalice; Flt. Sgt. J. W. Chaplin; Sgt. V. Charles; Sgt. R. W. Chelu; Sgt. W. Clark; Sgt. A. T. Clarke; Sgt. I. Cohen; Sgt. E. H. W. Coles; Sgt. H. H. M. Connolly; Sgt. D. A. F. Coole; Flt. Sgt. J. L. Cox; P/O. R. H. Craig; P/O. E. Crossley; Flt. Sgt. G. Croydon; Flt. Lt. J. A. Currie; Sgt. H. Dale; Flt. Sgt. D. A. Davies; Flt. Sgt. E. McH. Davies; Act. F/O. J. E. H. Davies; F/O. N. A. Davies; F/O. K. Davis; Sgt. J. Davison; P/O. R. Davison; Sgt. C. Dickinson; Act. F/O. H. F. Dod; Sgt. L. A. Dolby; Sgt. P. C. Dolman; Sgt. J. R. Eaton; P/O. D. G. English; Sgt. J. R. Fagg; W/O. C. T. Fairweather; F/O. M. A. Farr; Flt. Sgt. A. Finn; F/O. J. A. Fletcher; Flt. Sgt. D. N. Flitton; Flt. Sgt. G. E. Freeman; Flt. Sgt. A. McW. Frew; P/O. S. M. Futcher; Flt. Sgt. A. Garcia; Sgt. D. P. Gates; Sgt. H. M. Glansford; F/O. J. R. Glass; Flt. Sgt. P. E. Godsell; Flt. Sgt. N. Gordon; Flt. Sgt. D. Griffiths; Sgt. J. E. Gunton; P/O. A. Haigh; Sgt. T. Hamilton; W/O. W. A. Hannaford; F/O. P. E. G. Harford; Flt. Sgt. R. H. S. Hart; W/O. H. G. Head; Flt. Sgt. K. M. Henderson; Sgt. G. A. Higgins; Sgt. J. W. Holland; F/O. T. R. Holland; F/O. J. B. Hornby; Sgt. L. Horner; Sgt. A. Horridge; Sgt. J. Horton; Sgt. J. W. T. Hudson; Sgt. S. P. Hunt; Sgt. T. E. Hunt; Sqn. Ldr. C. J. K. Hutchins; Flt. Sgt. C. Jackson; Flt. Sgt. F. Jeffries; P/O. D. T. W. Jones; Flt. Sgt. E. Jones; Flt. Sgt. L. R. Jones; Sgt. J. J. Kearney; Sgt. V. A. Keen; Sgt. H. J. Kelly; W/O. J. C. Kemp; Flt. Sgt. J. Kennedy; Sgt. H. S. Kilsby; W/O. W. King; Flt. Sgt. V. Kumar; Sgt. S. E. Lanceley; W/O. J. F. Lane; Sgt. L. A. Lewis; Sgt. N. D. Little; Flt. Sgt. L. H. Lloyd; Sgt. D. B. MacKenzie; Sgt. R. Macleod; Act. Flt. Lt. R. E. Manvell, D.F.C., D.F.M.; Flt. Sgt. D. Marrows; Sgt. D. G. Marsden; F/O. E. C. Martin; Sgt. A. R. Marwood; Sgt. J. Mercer; Act. Flt. Lt. F. X. Merrick; P/O. D. Millar; P/O. G. Millar; P/O. E. M. Morris; Sgt. H. J. Newcombe; Sgt. D. W. Nicolls; Sgt. R. K. Nixon; Flt. Sgt. R. H. Norman; Sgt. R. H. Owen; Flt. Sgt. G. J. W. Parkinson; Sgt. G. Peace; Flt. Lt. J. D. Phillips; F/O. H. C. Polkinghorne; F/O. J. Poulter; Sgt. J. T. Price; Sgt. C. M. Pyke; Flt. Sgt. F. A. Read; Sgt. E. P. Richomme; Sgt. R. Roberts; Sgt. D. H. Robinson; Sgt. B. R. Scott; Wing Cdr. A. F. M. Sisley; F/O. T. T. Smart, D.F.C.; Sgt. D. V. G. Smith; Flt. Sgt. H. McP. Smith; F/O. J. K. Smith; Flt. Sgt. L. J. Smith; W/O. J. Southworth; Sgt. T. Spencer; Sgt. R. Syratt; Sgt. C. N. Tasker; Act. Flt. Lt. A. C. M. G. Taylor; F/O. C. D. Taylor; Sgt. G. Taylor; Flt. Sgt. H. G. Thomas; Sgt. R. W. S. Tilsed; F/O. G. L. Towns; Sgt. G. H. Tucker; Flt. Sgt. F. Urch; Flt. Sgt. P. G. Uren; F/O. W. D. Walden; Sgt. L. K. Webb; Sqn. Ldr. R. H. Weston; Sgt. H. Whitby; Sgt. R. W. Whitelam; Sgt. R. C. Wild; F/O. A. A. Wilks; Act. Sqn. Ldr. G. H. Wilson, D.S.O., D.F.C.; Flt. Sgt. A. H. Wood; Flt. Lt. P. W. H. F. Wood; Sgt. F. Woodward; Sgt. R. W. C. Yeaman.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Act. Sqn. Ldr. G. Campbell, D.F.C.; F/O. M. Ellwood, D.F.M.; F/O. D. G. Farquhar, D.F.C.; F/O. J. L. Halliday; P/O. W. Hodson.

PREVIOUSLY REPORTED MISSING, NOW REPORTED DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Flt. Lt. G. A. Kendrick.

MISSING, BELIEVED KILLED IN ACTION.—Act. Wing Cdr. W. D. L. Filson-Young, D.F.C.; Flt. Lt. R. G. V. Waters.

MISSING.—W/O. A. W. H. Aubrey; Flt. Sgt. R. S. Bennett; Sgt. R. G. Burke; Flt. Sgt. M. K. Farrington; W/O. J. A. Milner; Flt. Sgt. R. Moore; Flt. Sgt. J. Scott; Sgt. G. F. Smith; F/O. G. A. Wenning.

KILLED ON ACTIVE SERVICE.—A/C.1 J. Armitstead; Flt. Sgt. B. E. Branson; L.A/C. A. J. Burrows; Flt. Sgt W. Campbell; L.A/C. R. W. Chalmers; Wing Cdr. A. S. Dredge, D.S.O., D.F.C.; Cpl. H. S. Farndale; F/O. J. Fishwick; A/C.2 K. W. Halliday; W/O. B. S. Pollard; Flt. Sgt. A. W. Porter; Flt. Sgt. C. W. Powell; Flt. Sgt. T. C. A. Redstone; Flt. Lt. W. R. Robertson; Flt Sgt. R. M. Robson; W/O. D. C. Staddon; Sgt. J. H. Strudwick; F/O. B. F. Weaver; P/O. T. Wood.

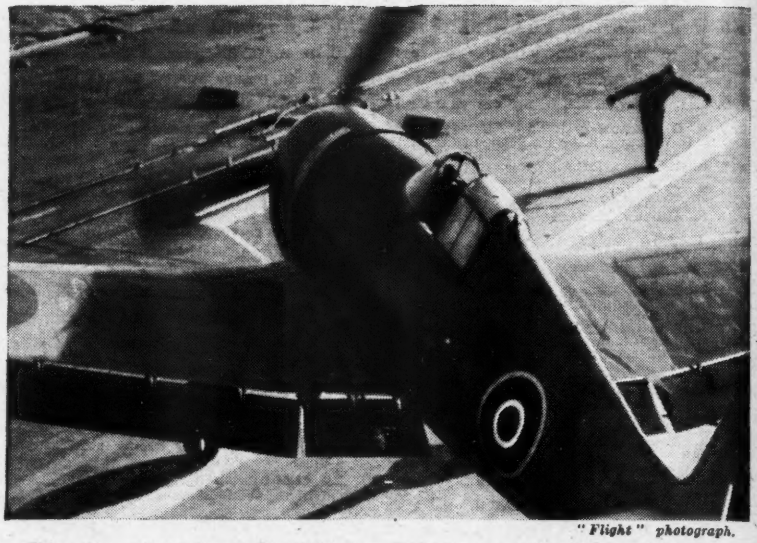
PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. E. Carley.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. P. Connell; Sgt. J. Crawford; Sgt. J. A. B. Finch; Sgt. R. Glover; P/O. L. Harris; Sgt. K. J. D. Huggett; Sgt. R. A. S. Scott; Sgt. J. A. Sherrit; Sgt. J. Snape; Sgt. R. E. Tibbles; Sgt. E. D. Wakefield.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Lt. W. Bolton.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—A/C.2 C. J. Riddel.

DIED ON ACTIVE SERVICE.—L.A/C. W. H. Baker Flt. Sgt. F. G. Barber; L.A/C. T. C. Barnes; A/C.2 J. D. Beal; L.A/C. C. J. Bevan; Flt. Sgt. R. Colling; L.A/C. J. Croisdale; L.A/C. D. A. Crowther; A/C.2 J. H. Dennis; L.A/C. T. G. Evans; Flt. Lt. E. A. S. Grant; L.A/C. J. Griffin; Cpl. J. L. Hewitt; L.A/C. D. M. McInnes; L.A/C. A. Mastin; Flt. Sgt. C. R. Mayes; F/O. K. Newman; L.A/C. L. V. O'Keefe; L.A/C. B. Pagin; L.A/C. A. R. Phipps; L.A/C. F. T. Pyrke; F/O. D. T. Robinson; L.A/C. F. R. Spooner; Flt. Sgt. E. J. Thomas; Flt. Lt. C. D. M. Thompson; L.A/C. R. Turner; L.A/C. R. A. Turner; L.A/C. M. J Whitfield; LA/C. A. Wilkie.



"Flight" photograph.

This picture shows how a Naval Air Arm Hellcat is ranged on the accelerator of a Light Fleet Carrier (H.M.S. *Ocean*). A board, seen just under an airscrew blade, locates the starboard wheel, and ensures the aircraft taking up an exact central position on the accelerator. The deck near the board is soaped to let the tyre twist easily.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—A/CW.1 F. M. Bowman; L.A/CW. F. A. Childs; A/CW.2 J. Dean; L.A/CW. F. M. Hunter.

Royal Australian Air Force

KILLED IN ACTION.—F/O. J. L. Breed; W/O. H. J. Kilday.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. V. W. Brown; Act. Flt. Lt. H. O. Cato; Act. Flt. Lt. R. R. Cowan; Flt. Sgt. J. L. Glanfield; F/O. S. E. Gough; Flt. Sgt. J. D. Hance; F/O. M. E. Hughes; P/O. R. W. Jefferies; P/O. D. T. Lee; W/O. N. N. McDonald; F/O. W. E. Marsh; P/O. M. E. Pratten; Flt. Sgt. C. B. Simpson; W/O. K. A. Sinclair; Act. Flt. Lt. L. C. A. Taylor; Flt. Sgt. W. T. Taylor; Flt. Sgt. L. C. Towler

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—P/O. W. E. Osmond.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—W/O. G. K. Pascoe.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. R. H. Scharf.

Royal Canadian Air Force

KILLED IN ACTION.—F/O. L. P. Hedley.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. H. R. Bailey, P/O. W. A. Bailey, Sgt. A. C. S. Barker, F/O. W. A. Bell, W/O. N. L. Berger, Sgt. E. W. Bookhout, P/O. W. Brown, Flt. Lt. W. H. Brown, D.F.C., W/O. H. R. Carruthers, F/O. W. R. Chowen, Sgt. K. W. Dewey, P/O. E. R. Duffin, Sgt. G. F. Finch, W/O. J. A. P. H. Gaboury, F/O. J. E. Gelinas, F/O. J. A. Grinde, F/O. F. N. Hack, P/O. S. F. H. Kelley, P/O. C. D. Knox, F/O. R. E. Lee, W/O. E. D. McDermid, Flt. Lt. A. MacDonald, Sgt. J. I. Magoffin, F/O. A. V. Maxwell, F/O. E. W. Monk, P/O. T. G. Murdoch, F/O. E. C. Pomeroy, F/O. S. M. Preston, Sgt. H. C. Seedhouse, Flt. Lt. M. E. Slaughter; P/O. W. G. Sorel; F/O. J. E. Taylor; P/O. J. J. R. Vannier; P/O. B. E. Welsh; Flt. Lt. H. L. Wolf.

DIED ON ACTIVE SERVICE.—L.A/C. E. E. Amlin; Flt. Sgt. R. E. Fontaine;.

Royal New Zealand Air Force

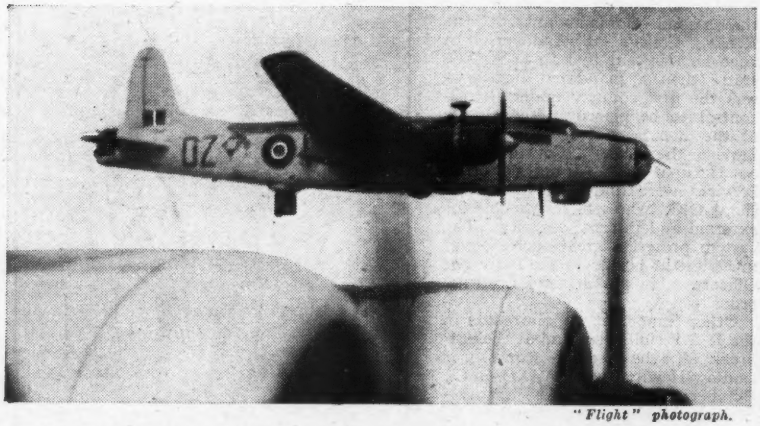
KILLED IN ACTION.—Act. Flt. Lt. J. T. McGreal.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—W/O. J. A. Ashdown; Flt. Sgt. R. W. Cuthbert; F/O. R. W. Herron; P/O. W. H. Killner.

South African Air Force

MISSING, NOW PRESUMED KILLED IN ACTION.—Lt. B. B. McLeroth; Lt. P. Muir.

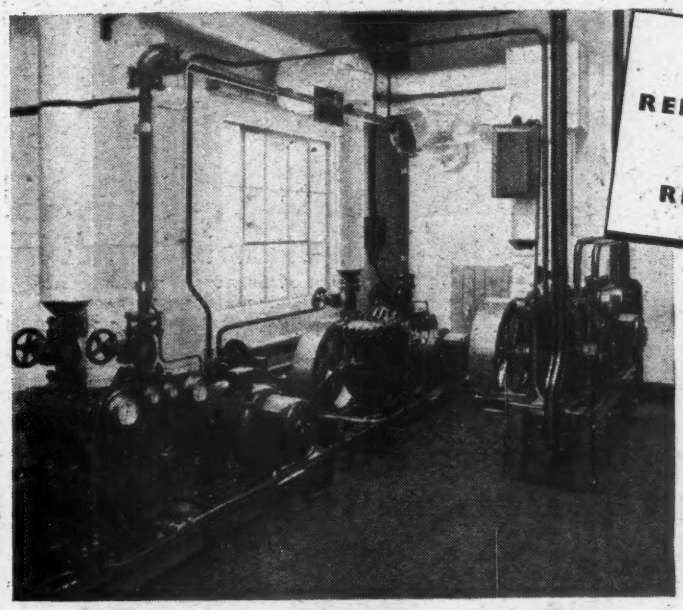
PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Capt. R. N. Day; Lt. J. R. Lund.



"Flight" photograph.

FOR GENERAL RECONNAISSANCE: A flying view of the latest Warwick—the Mark V—taken from a Coastal Command Liberator. Powered by two 2,500 h.p. Centaurus engines, its main external difference from earlier Warwicks is the revised nose and extra fin area.

TAYLORCRAFT AEROPLANES (ENG.) LTD., LEICESTER



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REFRIGERATION EQUIPMENT
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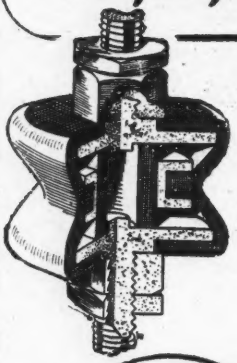

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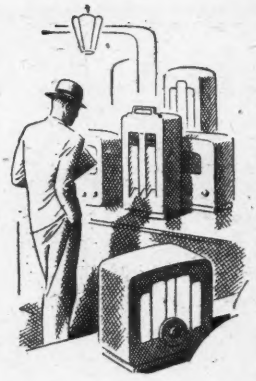

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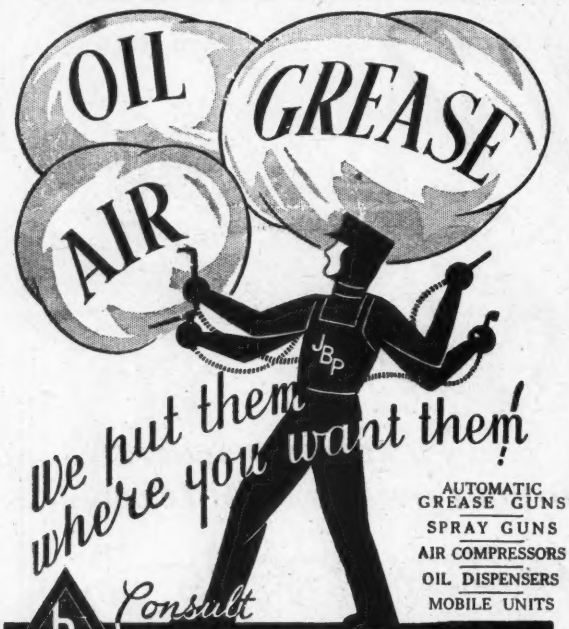

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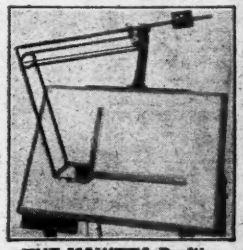

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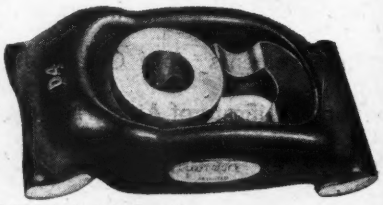

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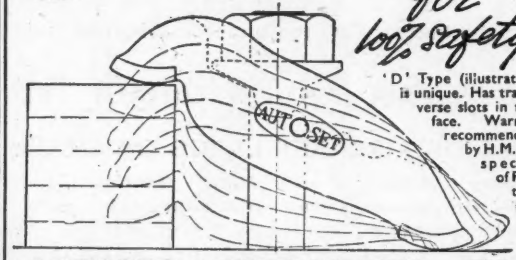

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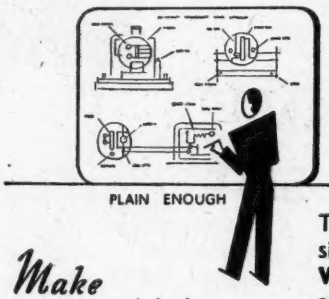

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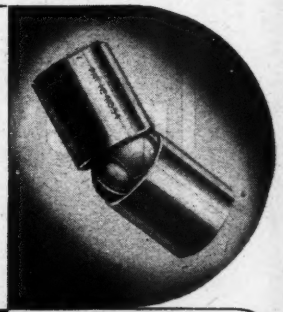

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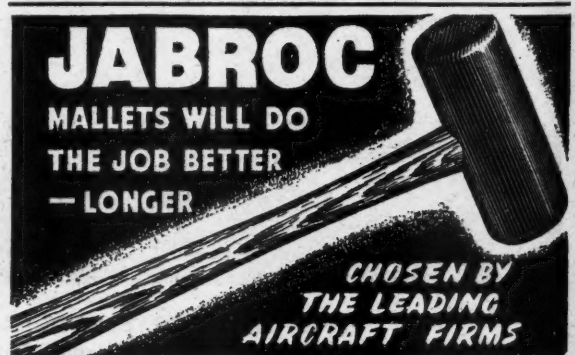

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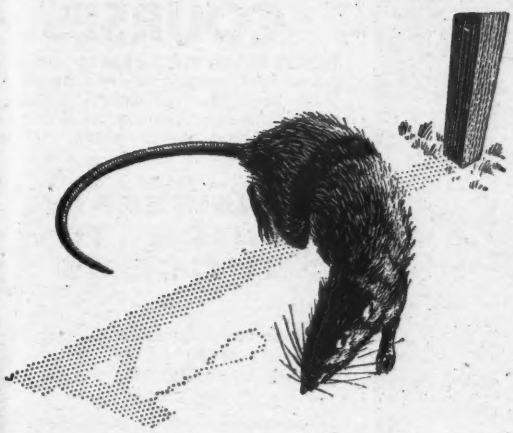

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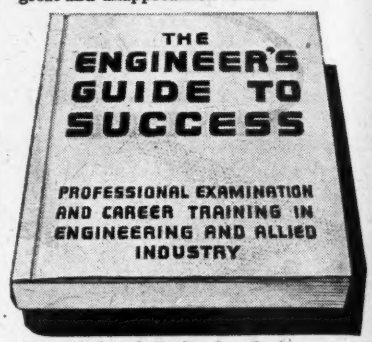

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R.A.F. 7 years, fitter, 2E, Class A release, age 27, secondary education, experience Merlin, radial American types, seeks post civil aviation.—Leah, Threecocks, Brecon. [6329

RELEASE R.A.F. pilot, age 24, 1,000 hrs. flying experience, including 100 hrs. on jet aircraft, accident free record, requires employment in civil aviation.—Box 4732, c/o *Flight*. [6350

CHIEF draughtsman, aircraft, experienced all types design; administration strong point; would consider leaving aircraft trade for firm of mechanical engineers.—Box 4857, c/o *Flight*. [6377

EX-W.A.A.F. officer (23), 3 years radar mechanic, 1 year equipment, fully qualified secretary, seeks job in connection with aviation; willing to work hard and travel.—Box 4731, c/o *Flight*. [6349

MODIFICATIONS.—Aircraft engineer, age 31, offers services of specialised experience in all aspects of modifications procedure, 12 years' aircraft and aero engine construction experience.—Box 4837, c/o *Flight*.

TECHNICAL manager, connected with aircraft since 1929, now free, intimate knowledge aircraft design and industry; very experienced pilot all types; interested small mechanisms; London area preferred.—Box 4856, c/o *Flight*. [6376

AERONAUTICAL engineer, age 31, single, requires appointment, London area; at present technical writer; 7 yrs. A.I.D., 5 yrs. examiner; trained D.H. Technical School (1932-1936); available on and from Jan. 21, 1946.—Box 4855, c/o *Flight*. [6375

DEMOBILISED R.A.F. officer (27) requires position with prospects in any capacity, anywhere; service includes 1,400 logged pilot hours on S. and Ts., B.A. instructor and Rapide passenger service experience; med. cat. A1.—Box 4859, c/o *Flight*.

CLASS A release Fleet Air Arm senior N.C.O., 5 years' service experience (airframes and engines), 4½ years' maintenance experience Imperial Airways and 1 year's aircraft factory experience (main assembly and erection), desires employment on maintenance work.—Box 4839, c/o *Flight*. [6366

R.A.F. engineer officer, Class A release, 10 years' service, flying boats, heavy and light aircraft, 5 years' civil apprenticeship motor engineering, considerable overseas experience, seeks position in aircraft or automobile servicing; home or overseas; age 30, married.—Box 4819, c/o *Flight*. [6358

EX-FLIGHT engineer, age 29 (commissioned), at present on release leave, desires post, flying or ground, where natural mechanical ability will be an asset, 2 years instructor (R.A.F.) on airframes, 2 years Transport Command, 800 hours, including 400 on Skymasters, excellent references; prepared to study for ground licences.—Box 4838, c/o *Flight*. [6365

SITUATIONS VACANT

SKILLED aircraft woodworkers, also inspectors, required by firm in North-West area.—Apply, giving full particulars of age, experience, etc., to Box 4733, c/o *Flight*. [6351

WANTED by a firm in North-West coastal area, experienced aircraft draughtsmen.—Apply, giving particulars of age, experience and salary required, to Box 4547, c/o *Flight*. [6301

WANTED, ex-R.A.F. transport mechanics and drivers; only those on release leave need apply.—Apply Personnel Manager, Marshalls Flying School, Ltd., The Aerodrome, Cambridge. [6056

AIRCRAFT inspector required, experience on four-engined aircraft; demobilised man would be ideal or man over 30; good prospects and wages.—Write full particulars to Box 4858, c/o *Flight*. [6374

SENIOR aerodynamicist required at once; good salary to experienced man.—Apply, stating qualifications, experience, age, etc., to Personnel Manager, Scottish Aviation, Ltd., Prestwick Airport, Scotland.

DRAWBENCH operators and shopfitting metal workers, required urgently by West London shopfitting firm; good wages paid to suitable applicants.—Apply, giving full particulars, to Box 4593, c/o *Flight*.

SOUTHERN AIRCRAFT (GATWICK), Ltd., have immediate vacancies for fitters and improvers for M.T. section.—Apply to Labour Supervisor, Southern Aircraft (Gatwick), Ltd., Gatwick Airport, Surrey. [0232

SECOND pilots required for service in Africa on one year contract basis of £40-£50 per month; candidates should possess Postmaster General's wireless licence in addition to "B" licence.—Box 4786, c/o *Flight*. [6354

DEGREE and Higher National standard mathematicians required for training as aircraft technicians.—Apply, giving age, full details of experience and education, to Personnel Manager, Fairey Aviation Co., Ltd., Hayes. [6324

WANTED by a firm in North-West coastal area, experienced stressmen, fully conversant with the stressing of aircraft structures.—Apply, giving particulars of age, experience and salary required, to Box 4548, c/o *Flight*. [6302

SENIOR and junior stressmen very urgently required; good salaries to suitable applicants.—Apply, stating qualifications, experience, age, etc., to Personnel Manager, Scottish Aviation, Ltd., Prestwick Airport, Scotland. [6346

AIRCRAFT inspectors and aircraft engineers' licences and airline experience required immediately. Also inspector with quarantine stores experience, and clerk used to airline technical records.—Box 4854, c/o *Flight*. [6373

WANTED, ex-W.A.A.F. personnel for civilian operated motor transport storage and maintenance unit in the following trades: typists, clerical, stores, maintenance, drivers, canteen staff.—Apply Personnel Manager, Marshalls Flying School, Ltd., The Aerodrome, Cambridge. [6193

SENIOR personnel are required for project design, weight control, installation of service equipment, aerodynamics, performance calculations, strength calculations.—Full particulars, experience and salary required to Taylorcraft Aeroplanes (Eng.), Ltd., Thurmaston, Leicester. [6371

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SITUATIONS VACANT—*contd*

EXPERIENCED aircraft draughtsmen and stress men with good mechanical knowledge required for experimental work in Maidenhead area.—Apply by letter, stating age, qualifications and salary required, to Box 4787, c/o *Flight*. [6355

EXPERIENCED and capable stressman wanted for responsible position in technical office; must be able to think for himself, instruct others and take full responsibility for his work; good prospects for the right man.—Box 4836, c/o *Flight*. [6363

WELL-KNOWN aircraft manufacturers engaged on the production of civil aircraft are seeking the services of a foreman for their fabric department; must have pre-war experience in cellulose spraying in the aircraft industry.—Box 4852, c/o *Flight*.

EXPERIENCED senior, intermediate and junior draughtsmen, also female tracers, required immediately.—Apply in writing, stating age, experience and salary required, to Personnel Manager, The de Havilland Aircraft Co., Ltd., Hatfield, Hertfordshire.

AERO engine stressing.—Required immediately, in the London area, an engineer fully experienced in all stress calculations for aero engines.—Applicants should write, stating age, qualifications, particulars of experience and salary required, to Box K.X.3, c/o 5, New Bridge St., London, E.C.4. [6352

MARSHALLS FLYING SCHOOL, Ltd., require for aircraft repair and maintenance ex-R.A.F. personnel, including airframe and engine fitters, aircraft carpenters, electricians and sheet metal workers; only those on release leave need apply.—Apply Personnel Manager, Marshalls Flying School, Ltd., The Aerodrome, Cambridge. [6208

VACANCY will occur in the near future for responsible designer with wide experience of aircraft undercarriages, or aircraft designer with undercarriage experience; four-figure salary to man with the right qualifications and experience in the aircraft industry.—Address replies to the Managing Director, Box 4604, c/o *Flight*. [6325

SECRETARY shorthand typist (unmarried), fully experienced, required by progressive industrial concern in Waltham Cross area; permanent and responsible position, requiring ability to work on own initiative; canteen facilities available.—Write, giving full details of qualifications, previous experience, age, and salary required, Box 4835, c/o *Flight*. [6362

AIRCRAFT inspector required by British West Indian Airways, Ltd., for service in Trinidad for one tour of 3 years in the first instance; salary T.$3,120 per annum, rising to T.$3,840, a cost of living bonus of 10% is payable at present (Trinidad dollars 4.80=£1); free passages; candidates must be qualified aeronautical engineers with experience as airline inspectors and should be familiar with American aircraft and engines.—Write, quoting C.3029A, to Ministry of Labour and National Service, Appointments Department, Technical and Scientific Register, Room 572, York House, Kingsway, London, W.C.2, for application form which must be returned completed by January 31st, 1946. [6360

OVERSEAS employment.—Junior aircraft electrician required by British West Indian Airways, Ltd., Trinidad, for 3 years in the first instance with prospect of further employment; salary T.$2,400, rising to T.$2,940, plus war bonus of 10% (Trinidad $4.80=£1); free passages; candidates must be single and have had experience in the repair and overhaul of all types of aircraft electrical accessories of American manufacture.—Written applications (no interviews), giving the following essential details, (1) full name, (2) date of birth, (3) qualifications and experience, (4) name and address of present employers, (5) details of present work, should be sent to The Secretary, Overseas Manpower Department (Ref. 1740/2), Ministry of Labour and National Service, Norfolk House, St. James's Sq., London, S.W.1. Applications cannot be acknowledged. [6359

OPPORTUNITY for ex-Servicemen.—The Fairey Aviation Co., Hayes, are prepared to train a number of men with some engineering background and education up to Higher National standard for the following: Draughtsmen, aircraft technicians, weight estimators.—Apply, giving age, full details of experience and education, to Personnel Manager. [6323

SENIOR planning engineer required by Northern Ireland branch of large engineering concern; applicants must have experience of planning large-scale wood or metal light engineering (not necessarily aircraft); position carries the responsibility of controlling a small planning office, and excellent prospects for a person of drive, organising ability and initiative.—Applications, stating age, experience, qualifications and salary required, to The Manager, Miles Aircraft, Ltd., Banbridge, Co. Down. [6337

PATENTS

THE proprietor of British Patent No. 496609, entitled Aeroplane Flight Control, offers same for licence or otherwise to ensure practical working in Great Britain.—Enquiries to Singer, Ehlert, Stern and Carlberg, Steger Building, Chicago 4, Illinois, U.S.A.

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COLLEGE OF AERONAUTICAL ENGINEERING (of Chelsea), College House, Princes Way, Wimbledon Park, S.W.19 (Put. 4197).—Practical training for civil aviation. Syllabus from Bursar.

MARSHALLS FLYING SCHOOL, Ltd., recommenced flying training on Tiger Moth aircraft on January 1st, including private, commercial, instructor and refresher courses.—The Airport, Cambridge. Tel. Cambridge 56291. [6369

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URGENTLY wanted, 2 5-point mags., carburettor and starter, for a Genet Major, or will any firm able to do job please submit tender to Hydrofin, 1, Mornington Av., W.14. [6368

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CONSULTANT scientist specialists in unusual problems; enquiries invited.—Box 4734, c/o *Flight*.

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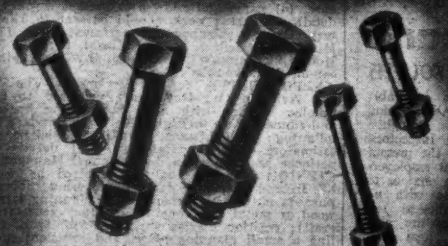

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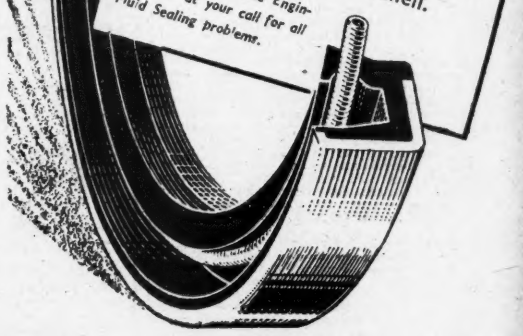

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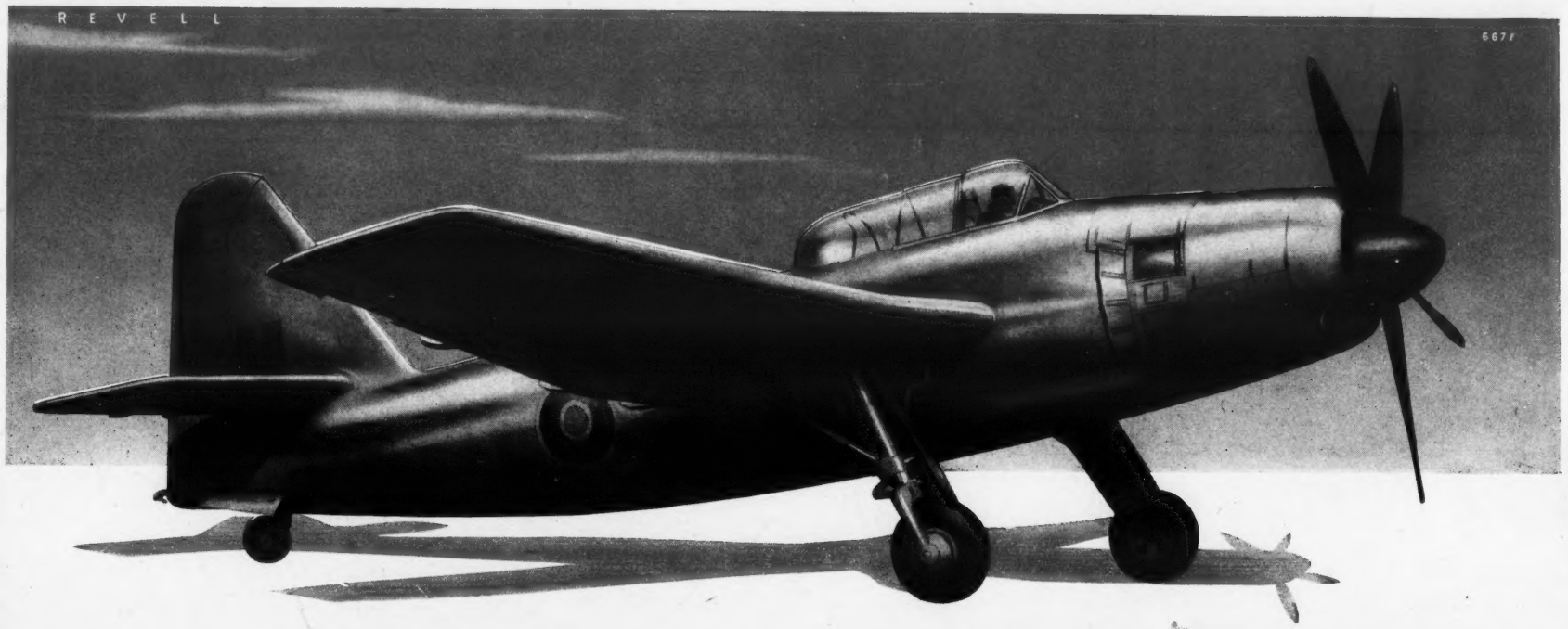

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